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HEDYCHIUM.

A POSSIBLE NEW PRODUCT FOR CEYLON.

Peradeniya, May 15, 1913.

At the tenth ordinary meeting of the Royal Society of Arts held in London on February 12th last a paper on "New Sources of Supply for the Manufacture of Paper" by Messrs. Clayton Beadle and Henry P. Stevens was read. Wood pulp is the raw material from which paper is chiefly made but it is now being realized that the world's supply of wood pulp is showing signs of exhaustion and that prices are rising. It is stated that the cost of production of ground wood pulp has advanced 50 per cent. in the United States during the last 10 years.

The paper trade has been turning its attention to other sources of supply of raw material and one of the plants to which attention is drawn is *Hedychium coronarium*.

This plant is of the same natural order as Ginger and Cardamom and grows profusely in Brazil as shown in the frontispiece taken from the Kew Bulletin.

It is propagated by root-stocks from which a crop in one year might be expected; from seed, two years would probably be required. It grows in damp localities near water courses at elevations ranging, in Ceylon, from sea level to 4,500 feet. In Brazil it has taken possession of land cleared for sugar which

HEDYCHIUM CORONARIUM AT PERADENIYA.

suggests that land suitable for the growth of sugar-cane would be suitable also for *Hedychium*. In that country it grows in a thick jungle to a height of from 3 to 6 feet; as many as 100 to 150 stems being counted in a square yard. After cutting down, a period of from 4 to 5 months elapses before a second crop is ready, the rainfall being about 60 inches per annum.

Root-stocks are continually being reproduced so that continual cropping year by year would seem to be ensured.

YIELDS.

It is estimated that well-covered land with stems say 4 inches apart would yield 7 tons of raw dried fibre equal to 4 tons of paper per acre per annum.

In the neighbourhood of Morretes in Brazil tracts of land of from 7,000 to 8,000 acres are covered with *Hedychium* capable, it is believed, of yielding at least 50,000 tons of dry fibre sufficient for the production of 30,000 tons of paper per annum. Another estimate gives 6-10 tons of dry raw material per acre per annum equal to 4 tons of pulp compared with 2 tons and 0·70 tons respectively of rice straw, 0·20 tons of pulp wood once in 40 years, and 1·35 to 1·57 tons of pulp from bamboo once in 5 years. *Hedychium coronarium* gives a greater weight of raw material per acre than any other product listed.

DISPOSAL OF RAW MATERIAL.

There are three methods of dealing with the raw material, the simplest being the drying and crushing between rollers of the stems after which they may be sent to Europe. This entails the payment of freight on a large proportion of unserviceable material.

Another method is to pulp the stems as is done with wood; a third method is to manufacture paper from the green stems on the spot. It is stated that the whole treatment from harvesting to the manufacture of paper need not occupy more than twenty-four hours.

No figures are available to show the cost of production of a ton of pulp or of the returns. Messrs. Clayton Beadle and Stevens obtained 4 per cent. and over of dressed fibre from *Hedychium* compared with 1½ per cent. from Manila hemp, the papers produced possessing a greater tensil strength than those of the strongest Manila papers. Owing to the semi-gelatinous nature of the cells a natural parchment can be made.

ITS VALUE FOR CEYLON.

As has been stated *Hedychium coronarium* occurs in Ceylon over a considerable range of elevation. In Brazil it takes possession of the land to the exclusion of all other vegetation but whether it would behave like that in Ceylon has not been ascertained. Its value will depend upon its power of spreading and reproducing stems. If it is found to flourish under irrigation it may prove a valuable product for our Dry Zone. There would appear to be ground for thinking that it may prove suitable for cultivation under the tanks.

A closely allied species, *H. flavescens*, is more widely distributed in Ceylon than *H. coronarium*, but its value as a source of paper has not yet been ascertained. Some dried stems are to be sent home for trial and also root-stocks from which green stems may be obtained on the spot for manufacture.

R.N.L.

TOBACCO.

FLUE CURING OF TOBACCO.

There is a large and ever-growing demand for a bright yellow, mild and sweet-flavoured tobacco both for the manufacture of cigarettes and for blending with the heavier grades of pipe leaf. For many years the Virginian and Maryland types were almost exclusively cultivated for this trade, but of late the White Burley with its heavier yield, mild flavour and bright colour has come into great favour. A distinct system of curing is adopted for this yellow tobacco, which includes the employment of artificial heat. A special barn, smaller in size than that employed for air-curing, and provided with a relatively large flue surface and furnace, is necessary to the work. The prime object in view is the bright yellow colour demanded by the market, and aroma is of less importance. In this case, therefore, the destruction of the enzymes by intense heat and rapid curing is permissible, and such destruction is proved by the fact that flue-cured leaf, if placed in a moist condition and bulked, as are cigar and pipe tobaccos, will not ferment, but decay. No other type of tobacco or system of curing requires as much skill and experience before successful results can be regularly obtained. The least misjudgment in the temperature applied will reduce a barnful of the finest leaf to a very inferior grade. The prices offered for the different classes of Bright tobacco are, however, sufficient to compensate for the slight risk attendant on this method when the necessary skill has been once acquired. No definite rules can be offered, for experience of individual barns and types of leaf is a factor of importance.

When the barn is full, and either primed leaf or the entire plants may be thus cured, the upper ventilators are closely shut and the fires started. A temperature of 85 degrees F. should be secured and maintained for eighteen hours or until the leaf commences to yellow. If this process be unusually protracted water should be sprinkled on the floor, or steam introduced from a boiler to hasten colouration. During this time the temperature must on no account be allowed to fall below 80 degrees, or rise above 90 degrees. When the leaves show a bright lemon colour, it may sometimes be well to open ventilators for an hour or two. This should be done at all times if moisture collects in beads on the leaf. After this airing, the barn is again closed and the temperature gradually raised to 100 degrees, and held at that point for six hours. Additional heat is then gradually applied at the rate of 2 degrees an hour until 110 degrees is reached, at which point it is held for three hours and then again increased by 5 degrees an hour to 125 degrees, and held thus until blade of leaf is dry, but stem still supple and moist. The doors and ventilators should then be thrown open to allow all free moisture to pass off. As soon as this is accomplished the barn is once more tightly closed and the heat raised by 5 degrees an hour until 140 degrees is registered. Where priming has not been practised and the entire plant has been hung, it now

becomes necessary to cure the stalk by raising the temperature to 175 degrees, at the rate of 5 degrees an hour. On no account must the heat ever exceed 180 degrees or the dry leaf may catch fire. The maximum should be maintained until the stalk is thoroughly dry, which will take about six hours. The doors and ventilators may then be opened, the fires drawn and the barn allowed to cool off.

The construction of the flue-curing barn is very simple, the building being erected with brick or stone to inside dimensions of 16 feet × 16 feet × 17 feet. A cupola ventilator at the ridge and four rabbit hutch ventilators on the sills should be provided. The roof should make an air-tight joint with the plant, and be lined with felt to prevent any possible draught. Care must be taken that no apertures exist at any point through which heat or moisture can escape. The arrangement of tiers and poles is the same as that adopted for air-curing barns, except where primed Turkish leaf is to be handled. In this case a vertical spacing of twelve inches between tiers will suffice. Up to this point the building is practically a small air-curing barn and may be used as such. The addition of the flues changes the character of the building. These are constructed of heavy black Russian iron piping, the length nearest the furnace being heavier than the remaining sections. The furance is simply a large brick arch built outside to the right of the door, and the flue leads from this practically at floor level, runs round the building at a distance of four feet from the wall, and comes out through the same wall and on the other side of the door. A length of flue half the height of the building is sufficient to carry the smoke away. Such a building which has been constructed at Weenen at an outside cost of £100, will cure an acre of tobacco each week during the season.—(Cedara Memoirs—Sawer.)

CURING CIGAR LEAF.

TEMPLE A. J. SMITH (Chief Field Officer.)

In order to make the tobacco leaf grown in Victoria more attractive and saleable, greater attention is required during the curing process; this takes place from the time the tobacco is harvested until the final fermentation has been completed, just before the leaf is packed for market. Simply drying tobacco leaf is not curing it, and colour, flavour, and general quality are all affected and greatly improved under a proper system of curing. Different kinds of tobacco require different systems to develop certain qualities for various purposes, and even variation in seasons will influence more or less the methods adopted. Tobacco harvested in cold wet weather will neither cure nor ferment as well as if cut after a few genial warm days, when there is not an excess of moisture in the soil. The proper curing of tobacco is partly chemical, partly a life process, and is not simply due to the drying out of surplus moisture. Tobacco, when just harvested, contains from 70 to 80 per cent. of moisture, and if this were simply dried out by heat, the leaf would remain more or less green, and be quite unsmokable, with bad burning qualities and no flavour, the starches and other constituents in the leaf

remaining unchanged, and the tobacco would have no value. During a proper system of curing, which is partly chemical and largely due to micro-organisms in the leaf cells, the outer skins of the leaves are broken and oxidation takes place, the colour of the leaf changes from green to brown, red or yellow, according to the class of tobacco treated. These changes are caused by enzymes or ferments in the leaf cells, which during the process split up existing chemical forms through their power of taking oxygen from the air and supplying it to the contents of the plant cells, and forming new products. These enzymes are easily destroyed by too much heat or too great cold. Temperatures of over 130 degrees Fahrenheit kill them, and at less than 60 degrees Fahrenheit their operations are stopped, while at freezing point they are destroyed. The most beneficial temperature is from 80 to 100 degrees, under which they do a maximum amount of work; also a certain degree of moisture is necessary for their proper working. It is, therefore, of great importance that the conditions suitable to them should be studied closely to insure success. If the cure be too fast the work is not properly done, and if too slow the process may go too far. Quick curing is, however, more dangerous than slow curing, and unless the matter is thoroughly understood by the operator it is wiser to cure somewhat slowly, especially in the early stages of the treatment. Enzymes are easily destroyed by too much heat and too rapid loss of moisture, but if the tobacco is made to dry slowly they multiply quickly and force their way through the outer skin of the leaves thus encouraging oxidation at a greater rate. Should they, however, be killed through scarcity of moisture, or by too much heat, they become enveloped in the insoluble protein in the leaf, and will not then be of use during the fermentation process which takes place later on, and the result will be a poor fermentation and consequent poor quality tobacco. Leaf of fine growth and appearance, if badly cured, may be utterly useless for manufacture, while the same tobacco, given a proper cure and fermentation, can be made a fine manufacturing commodity with all the desired qualities for a good smoke.

WRAPPER LEAF.

The various tobaccos used in factories require different treatments according to the purpose for which they are intended, as, for instance, cigar wrapper leaf for outside covers must necessarily be thin and silky, with good colour, fine veins, and a further virtue known to the trade as strength and stretch. Such leaf needs very careful treatment in both the cure and fermentation, as it will be too dry and brittle if cured fast, while if over-cured or fermented is liable to suffer in colour and elasticity. Only experience, combined with a knowledge of what the buyer requires, can determine exactly how far the treatment should go. Cover wrapper leaf is not sought after so much for its smoking qualities as for its appearance; it constitutes only a very small proportion of the cigar—about 5 per cent. of the whole—but it must have the characteristics mentioned, otherwise it will not sell well. The bunch wrapper, which is the portion of the cigar immediately under the cover of outside wrapper leaf, comprising 20 per cent. of a cigar, need not be as good in appearance and so fine in texture, but should have good flavour, and burn or combustion with a nice grey ash, its mechanical purpose being to

hold the filler leaf in shape before the cover wrapper is put on; such leaf must be sound and also be strong enough in texture to stand a fair amount of pressure without breaking? It must be free, as far as possible, from organic matter in the shape of starch and sugar, otherwise it will be liable when made into cigars to absorb moisture whenever the atmosphere is damp, and become soft, a bad sign in a cigar.

FILLER LEAF.

The filler leaf which comprises the greater bulk of the cigar (75 per cent.) must have good flavour and burn, be free from organic matter, and of fine texture, but colour is not of such great importance, though to insure high prices a dark-brown or lighter shade, which should be uniform, is desirable. Soundness, so far as holes or broken leaf is concerned, is not of great importance unless very pronounced, as the leaf is broken up by the manufacturer before being made into cigars. Flavour and freedom from organic matter, together with good combustion, are the chief points in cigar tobacco. A good aroma in all kinds of leaf is desirable, and this quality is largely developed in the cure and subsequent fermentation. Colours may vary considerably, and yet be good; a very light-coloured cigar wrapper is unusual, though the present taste leans towards the lighter shades, smokers being under the impression that a light coloured cigar is a light smoke; this does not follow, as the filler may be any colour from light to very dark, and as 75 per cent. is filler, that portion has the greatest influence. When we take into consideration the fact that the soils the tobacco is grown in produce leaf of varying descriptions, requiring a more or less fast or slow cure, also that seasons affect the condition of the tobacco, and that the various tobaccos are needed for different purposes, it will be realized that a thorough study is necessary by the individual grower as to the special treatment required to develop to the highest possible effect the different qualities of leaf with regard to the tobacco he is producing, especially in a new country where fresh districts are being exploited. A good crop of tobacco can be absolutely ruined by bad treatment in the curing and fermentation, or by good treatment made a valuable and highly profitable crop. The foregoing remarks apply equally to pipe tobacco in main, except that cigar leaf requires more careful handling, especially in fermentation, than pipe leaf. The proportionate amounts of wrapper, bunch wrapper, and filler leaf in each are approximately the same, and exercise the same influences in their way.

AMERICAN SYSTEM.

In curing cigar leaf, the changes which the leaf must undergo are controlled by the regulation of heat and moisture in the shed, and until very recently fire or flue curing has not been followed, excepting in cases where continual fogs or heavy moist atmospheric conditions have existed. Curing proceeds slowly in cold dry weather, but drying takes place; while in warm moist weather the changes in the leaf constituents that are necessary take place, and tobacco cures fast. Thermometers should be kept both with wet and dry bulbs to ascertain the temperature and relative moisture in the air, both inside and outside the building. It has been found that the best temperatures at which the leaf cures in dry weather are when the inside temperature is over 70 degrees Fahrenheit, and the outside temperature is 10

or 12 degrees less; while a difference of 15 degrees Fahrenheit in wet weather is best. Tobacco will cure well at any temperature between 70 and 100 deegres Fahrenheit, but, as previously stated, it is safer to cure slightly on the slow side. While the leaf is curing fairly fast ventilation must be provided to carry off surplus moisture, especially in wet weather, or when the outside air is surcharged with moisture. The relative percentage of moisture should be between 50 and 60 degrees. In Victoria the climatic conditions are not as cold as in many tobacco countries, but the air is in some districts drier, consequently artificial methods of supplying moisture may be found advisable, such as watering an earthen floor, or covering with a few inches of straw and applying water, which, as it evaporates, increases the atmospheric contents. In dry cold weather the shed should be kept closed, with no current of air, or a very slight one, but the top ventilators should be sufficiently open to take off the moisture evaporating so that it will not settle from the top on the tobacco, the idea being to keep the tobacco during a cold spell from drying out, while not curing. The life will remain at such a time dormant, and directly the right degree of temperature—65 to 70 degrees Fahrenheit—obtains again curing will be recommenced. Cigar leaf during the process should not be allowed to get so dry that the leaf will break upon being handled, and should be so managed that at least once in every 24 hours it becomes soft until finished, this can be regulated by the currents of air admitted through the ventilators. It will be realized that no hard-and-fast rules can be laid down in this respect, as the treatment will vary according, to weather conditions and the stage reached by the tobacco. In the early part of the cure the moisture is driven off fast if weather conditions are suitable, but if cold and dry the shed should be kept closed to prevent its loss at too fast a rate. It may take four weeks only to cure a shed, and in some seasons twelve weeks, the latter period being more usually required unless artificial heat is applied. Only experience will tell the operator in charge when the leat is ready for its special purpose before bulking down for fermentation. The colours should be fairly even throughout, the texture of the leaf thin, pliable, and devoid of vegetable matter, with not more than a 10 to 20 per cent. moisture content. Leaf for filler purposes and for bunch wrapper will generally require a longer and more thorough cure than cover wrapper leaf, the natural tendency to thinness and lighter body in the latter having less organic matter to be disposed of. Here, again, the operator is the sole judge as to when the cure has gone far enough for his purpose; the tendency amongst Victorian growers is, however, to cure too fast and not quite enough.

As soon as the leaf is cured the shed should be kept close and dark; if light is freely admitted the colours are liable to suffer. Some growers favour putting the leaf down in bulk at once after curing, re-hanging later on, while many prefer leaving the tobacco hanging in the shed until ready for fermentation. Tobacco leaf can be put down in bulk in cold weather with 20 per cent. of moisture, but is liable to ferment when warm weather ensues, and should consequently be watched, and if heating it should be turned, otherwise it might go so far as to rot, and the season's labour be lost. The main matters to be carefully watched are :—

1st. To so control the air currents so as not to dry, or cure, too fast in the initial stages of treatment.

2nd. To keep, whenever possible, the inside temperature 10 to 12 degrees Fahrenheit above that of the outside shade temperature.

3rd. To close the shed when curing is finished, and, if much damp weather follows and the leaf is inclined to become mildewed, open the ventilators on a dry day, or put slow fires underneath sufficient to drive off superfluous moisture.

ARTIFICIAL HEAT.

The curing by the aid of stoves have been recently adopted in the Connecticut Valley and Florida, in America, in regard to cigar leaf, and a useful pamphlet written by W. W. Garner, of the United States Department of Agriculture, in which the following directions for curing cigar leaf by artificial heat are given :—

"No heating system will give satisfactory results in a barn or shed which is not reasonably tight, because the temperature cannot be raised sufficiently without drying the tobacco too fast. On the other hand, a system of ventilators which can be opened or closed at will is necessary for the removal of excessive moisture in the shed in wet weather. If there is no ventilation the air soon becomes saturated, and heat alone will not drive it off. When artificial heat is used it is not desirable in filling the shed with tobacco to leave open spaces from top to bottom, as these will only act as channels for the escape of heat to the top, while to be effective it must be forced to pass through the tobacco.

The heating system must have sufficient capacity; a little heat is frequently worse than none, particularly in the control of pole sweat. Experience has shown that a satisfactory system must be capable of maintaining a temperature in the shed of from 15 to 20 degrees higher than that of the outside air when moderate ventilation is used. It is only necessary to maintain this temperature when there is danger of pole sweat; under ordinary conditions a difference of 10 to 12 degrees between inside and outside air is sufficient. The heat must be supplied from the bottom of the shed and be evenly distributed in order that, so far as possible, all the tobacco may receive the same treatment.

Open fires of clean burning wood and charcoal can be used, but it is necessary that special precautions are taken in case of fire, and only clean burning wood is used, as very heavy smoke from fires is apt to injure the tobacco. Charcoal is expensive, and there can be no doubt that the stove and flue curing system is best, as temperatures can be better controlled, and there is less danger of injury from excessive smoke and fire.

Coke and coal are not suitable fuels, as they generate injurious fumes, chiefly sulphur dioxide, which will damage the tobacco.

Should open fires be used, it will be found necessary to have many small fires in preference to a few larger ones, in order to distribute the heat more evenly, and appliances in the shape of deflectors in the shape of sheets of iron over the fires have good effect.

Practically all the cigar types are air cured, but judicious management of artificial heat will result in a more perfect product.—JOURNAL OF AGRICULTURE, VICTORIA.

COCOA.

ITS CULTIVATION AND PREPARATION.

By W. H. JOHNSON, F. L. S.

In this book on cocoa the author seems to have had the advantage of studying his subject under various conditions and in a variety of countries.

Cocoa is indigenous to South America and was first brought over to Europe by Cortes. Brazil is the largest producer, Ceylon coming ninth in order; the United States is the biggest consumer.

Cocoa flowers are so constructed that outside aid appears to be essential for pollination. Uzel, who investigated this in Ceylon, came to the conclusion they were pollinated mostly by thrips and that these insects occurred more abundantly in sunlight than in shade, a fact that should be seriously considered in the vexed question of shading.

As regards the best soils for cocoa, well-drained soils rich in lime and potash seem the most suitable. Owing to the long taproot of the cocoa tree stony or water-logged soils are most undesirable.

The young and delicate foliage is particularly susceptible to strong winds, therefore sheltered positions should be chosen or good wind-belts planted. The author advocates planting Forastero 15 feet apart; other varieties closer, holes 3 feet by 2 should be dug two months before planting and then be filled with any good soil near at hand or with surface soil.

Planting out in baskets is advocated as the best method of transplanting! even then 30 per cent. must be expected to fail.

The author discusses the question of shade which seems a conflicting one. Grenada, for instance, grows her cocoa without shade affirming it to be injurious; in other places it is the reverse. Even in one island, such as Ceylon, planters are found growing it with and without shade. But the majority certainly advocate shade. No doubt it is largely a matter of what the cocoa has been brought up to—to suddenly remove all shade when the trees have become used to it, is certainly injurious. Perhaps the best method is the happy medium—start the cocoa well shaded when young and gradually removing the shade till it remains very light or even leaves the cocoa unshaded at its prime—say ten years old. If catchcrops, such as cassava, are used as shade for young cocoa the land should be well manured afterwards or the soil will become rapidly exhausted.

In selecting beans for planting in the nursery, only those of mature fruits from trees which are quite healthy and heavy croppers should be selected and then only the beans in the middle of the pod used. The author describes the best methods of budding and grafting, but these methods are not very satisfactory and not much in vogue amongst planters.

In some countries, Jamaica for instance, the cutting down of weeds and not hoeing them up is practised. This is particularly beneficial on hillsides as it prevents surface-soil wash and at the same time forms a good mulch.

The chief disadvantage of cutting down the weeds lies in the fact that noxious perennial weeds may become established. As regards pruning the author advocates no particular method but advises light pruning at frequent intervals in order to keep the tree well open for the admission of the all-important light and air; removing the gormandising suckers and thus obviating the removal later on of big branches as happens in pruning at longer intervals.

If cattle manure is available in sufficient quantity and is applied by lightly forking in the author is inclined to think it superior to any artificial manure as it has so beneficial an effect upon the texture of the soil so necessary to cocoa.

Of chemical manures, basic slag and sulphate of ammonia seem to suit cocoa the best and one planter in Grenada during three years increased his yield by over 100 per cent. through applying a mixture of 8 cwt. of basic slag and 1 cwt. sulphate of ammonia.

Green manures are excellent whilst the cocoa is young as they keep the surface cool and moist for the surface-feeding roots of the cocoa and give a good percentage of nitrogen; crotolaria striata being one of the heaviest yielders.

There are some excellent chapters on the various pests of cocoa animal, insectiferous, fungoids. Rats appear to do enormous damage in some countries and their natural enemies should be carefully preserved. In Ceylon there is the large brown rat-snake which is quite harmless and watchers are very apt to shoot these when they should be rigorously preserved.

Too much shade or moisture are conducive to fungoid attacks and canker is always more prevalent after heavy rains. Canker must be constantly cut out but antisepticising the wounds, not usually practised in Ceylon is advocated by the author.

The question of fermenting and washing the beans is one on which the author has much to say and many various experiments from which to draw his deductions.

It seems that 140° F. is about the most perfect temperature, anything above that being apt to discolour the beans. In many countries the cocoa suffers in quality from being insufficiently and not uniformly fermented, the latter fault being due to inadequate aeration. The beans in the centre of the mass do not ferment as readily as those on the outside in contact with the atmosphere.

As to washing the beans or not after fermentation the pros and cons seem equally divided and of cocoa buying firms some seem to prefer the washed whilst others uphold the unwashed. The enhanced price of Ceylon cocoa is sometimes quoted in favour of washing, but the author thinks this to be due more to the percentage of cinnamon-coloured kernels and general good quality than to the washing, and if this is the case it seems a waste of labour.

Wooden fermenting vats are preferable to cement owing to the acid liquid acting on the cement and causing it to crack.

The author has some useful hints on the best methods of drying and ends his book with a chapter on the cost of producing cocoa in various countries and its manufacture into chocolate.

D. S. C.

CULTIVATION OF CACAO IN TOBAGO AND TRINIDAD.

Mr. A. V. Stollmeyer who delivered an address before the Arima District Society on the 13th January last in dealing with the question of shade for the cultivation of cacao is reported in the proceedings of the Agricultural Society of Trinidad and Tobago to have said:—It has been clearly proved, I think, that the conservation of moisture in the soil is one of the essential features for the successful growth of the tree, and also for the production of fruit ; this is quite true, but sunlight is also a very necessary factor. Then why do we have shade over the cacao trees? The obvious argument in favour of shade must be for protection from the wind. By establishing shade we contribute to the maintenance of moisture. In the hills, therefore, where nature offers its own shelter from the baneful influences of the wind, an advantage would be gained by lessening to a great degree the present existing amount of the shade in those localities. The degree of reduction must, of course, be in keeping with the individual situation of each field ; the results, I am sure, would add to the healthiness of the trees and tend to increase your crop. Regarding the vegas where the trees are open to all weathers great care should be exercised. The reduction of shade there, seems in my opinion very necessary, yet precautionary measures must be taken to make provision for the exclusion of the wind. The only means to accomplish this is the establishing of wind belts. A very gradual reduction can be commenced while the wind belts are growing, then, when thoroughly established, reduce further shade with the object of admitting the certain amount of sunlight that seems necessary, without unduly exposing the soil to the continuous rays of the sun. The past abnormally dry season has been quite a useful object lesson in many ways, and especially bears on this question. I have come to the conclusion that a reduction of shade together with established wind belts, as against the total abolition of shade, is the desirable condition for the welfare of an established estate. I have dilated somewhat lengthily on this question, but it is one which has been occupying the minds of most thinking planters for a considerable time, and one of more than passing importance.

SEED SELECTION.

Perhaps I have put the cart before the horse and should have commenced at the nursery—where everything and everybody does. So I will now say a few words with regard to the importance of planting the best quality seeds. I can do no better than refer you to the many occasions on which addresses, dealing with the importance of selection, have been delivered by Mr. Freeman of the Department of Agriculture and by Dr. Fredholm, a worthy and learned member of the Agricultural Society. To select the best developed seed in size and quality from the best strains of cacao and from the most healthy trees should be your first step ; plant no other and see that your contractors do the same; the extra trouble and patience that you exercise in this direction will repay you. Do not plant any and every kind, it will be love's labour lost and prove a disappointment to you. To those of us who

are more progressively inclined, and indeed we all ought to be, I would advocate strongly to become acquainted with the art of grafting. It is to be regretted that our education as planters on this subject and others has been so sadly neglected. This manner of propagation is the one adopted in most progressive countries; it is the one admitted to give the surest and quickest results.

We in Trinidad, I regret to say gentlemen, are behind the times. It is however not entirely our own fault; we are willing to learn, but apparently the machinery to impart that and other progressive knowledge is lacking. We want knowledge of this kind brought more within our practical reach; we will then find no excuse for not applying it; and for not boasting an equality with other Agricultural countries. But I am digressing. To return to the subject of seedlings, I would say the best mode of raising your nurseries and supplies is in bamboo pots; by so doing you are less likely to cause damage to the roots in transplanting, and you will be sure that the plant you are setting out is or should be a healthy one. Once planted out do not neglect it; give it perhaps more care than you do now—especially in the dry season; at that time of the year, however much shade you might have over the young plant, you must devise means of retaining sufficient moisture in the soil, if only in that portion of the earth immediately around which its young roots lie. Till the soil around and mulch it. If you cannot do both, do the one or the other, but mulch in preference. The young leaves and stem of the tree do not require as much attention as the roots, therefore do what little you can to help it, wet or drought. You cannot say whether or not we are to have as lengthy a dry season as we did last year, therefore take warning and profit by experience.

METHODS FOR IMPROVEMENT.

And now, gentlemen, let us assume that a period of some years has lapsed and our trees are no more young, but have reached the bearing stage and worthy of the name of an "estate." Are you still content to follow the old style of pick and brush? Times are hard, I know, gentlemen, and our bank balances are small, but if you do my friends it will mean the same old story of retrogression. There are few estates to-day, if any, on which this mode is followed, and which can boast of the return of the good old days. All manner of excuses are brought forward; not infrequently the vagaries of the weather are raised; but never do you blame yourselves! And now this brings me to the soil. In our endeavour to help our trees to bear, we prune, we take off suckers, some of our more ambitious, but not many take off the pines and moss, and very few think of tilling the soil. I have heard it said: "Oh, but my soil is too good, it doesn't require tilling." No soil is so good that it does not improve by tilling. Apart from the physical gain to the soil, tilling will invigorate the root system. Root pruning judiciously done is nothing new for cacao; in Grenada it is a common practice and I am led to believe has produced excellent returns. The necessity for careful work is another point of equal importance. In clearing the field of grasses and other weeds, whether done by the hoe or the cutlass, very great care should be taken not to cut the trees. It is a fault too often committed. This could easily be checked if every proprietor would refuse to overlook it. There is an

ordinance under which labourers can be prosecuted for damage of this kind and as an extreme measure it should be taken advantage of. The same care and attention should be given to clean and close cutting of all branches in pruning all which, if practised, would tend towards better results.

Draining is another important feature and besides serving the purpose of getting rid of the surplus water, tends to aerate the soil and add to its physical welfare.

CACAO HUSK AS FOOD FOR MILCH COWS.

The following article by J. E. Lucas has been reproduced from the *Annales de la Science Agronomique* in the *Bulletin of Agricultural Intelligence.* The writer gives an account of some feeding experiments which he made with cacao husk for the purpose of ascertaining its effect upon the milk yield of cows. There were four experiments in all; in the first were two lots, in the second three lots and in the third two lots: each lot consisted of four cows. In the fourth experiment two lots, each of three cows, were used. All the lots were as similar as possible.

Each experiment consisted of a preliminary, a principal and a concluding period. Experiments I. and II. each lasted a month; the two other experiments occupied a somewhat shorter time.

In every case a control lot was fed on rations of bulky food, maize-gluten and bran, while in experiments I. and II. the bran which the other lots received was gradually replaced by cacao husk; the latter was entirely substituted for the bran in the principal period: $4\frac{2}{5}$ lbs. of cacao husk per cow per day in the place of $3\frac{1}{3}$lbs of bran; for a short time $6\frac{3}{5}$ lbs. of cacao husk was fed. In experiment III. only part of the bran in the rations was replaced by cacao husk, and at the conclusion or experiment IV. an addition of 750 gr. ($1\frac{3}{5}$ lb.) of cacao husk was made to the full rations containing the usual amount of bran.

During the time of the experiments, every milking was weighed and the fat content of the milk determined by Gerber's test.

The summary of the results of the experiments is as follows :—

(1) The cacao husk used noticeably diminished the milk yield, the decrease being as much as 20 per cent.

(2) At the same time, it increased the fat content of the milk per volume as much as 20 per cent.

(3) The cacao husk had little effect on the fat content taken as a whole, although this varied slightly, being sometimes greater and at others less.

The writer states that Faelli (*Moderno Zooiatro* 1898) obtained increased milk yield and fat content by feeding cacao husk; he considers that husks of much fermented cacao decrease the milk yield less than those of little fermented cacao such as he used in his own experiments.

RUBBER.

PREPARATION OF HARD CURE PARA.

By HAND MOULDING.

On the 20th March last Mr. H. A. Wickham, the father of plantation rubber in the East, demonstrated at the Government Experiment Station, Peradeniya, how hard cure Para by hand moulding was made, the first time this has been done in the East.

Mr. Wickham has made rubber himself by this method on the Amazon, working with the natives there. Compared with the smoke curing apparatus the method is wasteful, slow and laborious; but on the other hand no expensive apparatus is necessary; all that is required being a native-made clay oven and a hoe handle.

The process consists of pouring the latex over a round piece of wood like a hoe handle; then holding it for a minute or two over the orifice of the oven from which hot smoke issues, the piece of wood being slowly revolved in order that all parts of the latex may come in contact with the smoke. Within a minute or two when curing has been effected another film of latex is poured over the thin jacket of rubber and the process repeated.

CEYLON EXHIBITS AT THE INTERNATIONAL RUBBER EXPOSITION OF 1912.

EXTRACTS FROM THE REPORT OF THE CEYLON COMMISSIONER.

Mr. F. Crosbie Roles, Ceylon Commissioner, reporting on the exhibits sent from Ceylon says that the 96 cases of exhibits from Ceylon and 24 cases of competition rubber forwarded on separate manifests were ready in Colombo in good time :—It had been arranged to ship by the American-Indian line, and Messrs. Bucknall Bros. had been good enough to undertake to transport the 96 cases freight free. Unfortunately a vessel expected about July 20 did not arrive, and when it was arranged to ship by the ss. "Koranna" at the end of that month, we were not advised that she was one of the slowest vessels of the fleet. The result was that leaving on July 30 she did not reach New York until September 23—the official opening day of the Exposition. An additional day had been lost at Philadelphia owing to the breaking of a winch. The "Koranna" thus made a record slow voyage for the year of 54 days between Colombo and New York, and had the consignment been forwarded six days later by the Company's next steamer, it would have reached New York four days earlier, namely, on September 19. There

being no news of the "Koranna" up to so late as September 16, it was suggested that I should arrange to have the cases taken out of the ship on her arrival at Philadelphia and brought by train to New York. Nobody, however, could tell what the cost of this would be and whether there would be delay on the railway, and the New York Customs authorities also informed me that nothing but an order from the Secretary of State at Washington would admit of bonded goods being landed at a port other than the port of consignment. The New York Customs Commissioner showed me every consideration, especially when I produced my official letter of introduction to the British Ambassador, and on its being announced that the "Koranna" would arrive at New York on Sunday morning, September 22, all port rules against Sunday working were waived. Police permission for the passage of loaded vans through the city was also obtained. Then the accident to the ship's machinery occurred, with a fog down the river on the Monday morning, so that the vessel was not made fast until 10 a.m. on the 23rd. There was no urgency for the competition rubber, but it was found that the 120 cases could be handled quickly, and they all reached the third floor of the Exposition building—the crude rubber section—at 6·30 p.m. Special assistance was in waiting, and by midnight we had everything in position, except the Peradeniya botanical charts which had to be mounted. The rubber exhibits opened out well. Some cases were unnecessarily thick and heavy; but as regards packing, in no case had paper been used, and where chetty cloth had been employed care had been taken so that rough edges should not be touching the rubber. In several instances nails had been driven into the rubber as the result of additional bands being used to strengthen the chests. All the sheet rubber shown on the Ceylon stand was smooth, and the sheets lying close to each other prevented the circulation of air. This leads to fungus growths and to the sheets adhering. Corrugated sheet is preferable. The glass of some of the other exhibits had suffered in transit.

DISPERSAL OF THE CEYLON EXHIBITS.

Many applications were received from public institutions in New York and elsewhere for gifts of exhibits; and I distributed the rubber tree trunks, bottles of latex and other available things amongst the leading institutions that applied. In some cases their presidents and directors made application in person. The Government had sent forward 180 copies of that well-illustrated and attractively compiled publication, the Ceylon Government Railway Guide, and in sending these to selected libraries and schools and other institutions, and in presenting copies to representatives of distant countries and to other travellers, I felt that something was being done to disseminate general information about the Island and to attract additional visitors to it. There was a considerable demand for copies of the photographs exhibited for illustration purposes, and the picture that attracted most attention was the one in which Mr. H. A. WICKHAM stands by the tree of record yield at Henaratgoda. Not only were copies of this made by the Exhibition photographer for press purposes, but the Director of the great Philadelphia Museum also had it specially photographed. For the clearing away of all signs of the Exposition only two days were available, as the

building was required for an electrical show; and the work was carried on under great pressure, but with little confusion owing to good organization. Foreign exhibitors, however, had the tiresome task of packing things for reshipment in the same cases in which they had arrived. This was a condition insisted upon by the Customs officials in return for the privileges of admitting the exhibits in bond.

EXPENDITURE.

The total expenditure in New York on Government account—in addition to the £723.12s. paid for the floor space taken at the Exposition—was $3,913.15, and to this falls to be added the expenditure in Ceylon of the Exposition Joint Committee. There will be a small balance in hand out of the public money vote of Rs. 30,000. The preliminary estimate of expenditure earmarked the whole of this sum, leaving no margin on which the Commissioner could draw if he found that special expenditure, on publicity or any other form of exploitation, was required. Representations were consequently made to the Rubber Estate Companies registered in Ceylon and also in London, with the result that Ceylon Companies subscribed the equivalent of £225, and the London Companies £95.5s.4d., besides £40 which arrived too late. I was glad to be placed in funds for any emergency but finding that Ceylon was the trade name for plantation rubber, and that no other Eastern country proposed to enter the advertising field, no special expenditure was called for, and I felt it my duty to return the amounts subscribed. The money has been redistributed by Mr. W. MARTIN LEAKE in London and by Mr. F. M. SIMPSON in Ceylon with an expression of thanks to each contributor.

TEA.

The name of Ceylon is so well-known in North America, partly because of the expenditure of one million dollars during the past twenty years in the exploitation in the United States and in Canada of Ceylon Tea. Although the Thirty Committee has had to close its propaganda programme, it did not wish the opportunity of Ceylon's participation in a New York Exposition to take place without Ceylon's staple export being displayed, consequently the Committee voted a sum of Rs. 1,000, and arranged for the production of an illustrated pamphlet on tea for free distribution, and for 10-lb. samples of the various grades of high-grown, medium and low-country black teas put up in special boxes for exhibition at the Ceylon stand, to which were added, through the instrumentality of the Hon. Mr. E. ROSLING, an exhibit of green teas. I was also to make use of any balance. I am reporting separately on this subject to the Thirty Committee, and need only mention here that Ceylon tea was used at the special "At Home" Day on September 27, and that 480 2½-oz. packages, specially printed "With the Compliments of the Tea Planters of Ceylon," were distributed towards the close of the Exposition as a set off to the free distribution of coffee samples by the Brazilian Commission. It will also be seen from the accounts that a proportion of the cost of the central structure in the middle of the Ceylon Court, and of the newspaper advertising appear amongst the items charged against the Thirty Committee's vote.

A VISIT TO WASHINGTON.

On leaving Ceylon I had been given an official letter of introduction to the British Ambassador at Washington. Mr. Bryce was away on a visit to Australasia when I arrived in America; but I waited upon him at the end of October and was well received. The Right Hon. gentleman made a number of inquiries about planting industries, and gave me cards of introduction to the heads of several departments, including that of Insular Affairs, where I was supplied with volumes of reports and other information respecting rubber cultivation in the Philippines which, I may remark, like other Eastern countries, obtained its first supplies of *Hevea brasiliensis* from Ceylon.

One very interesting visit paid was to the Treasury Department, where I was allowed to see at close quarters a machine for laundrying soiled currency notes. It had recently been decided that the new departure was a complete success, and the principal sub-treasuries in the country are also to be supplied with washing machines. The process is of the simplest and is inexpensive. The notes are rapidly passed through a solution of soap and chemicals and over-heated rollers, and a small machine can deal with 3,000 an hour. All notes that are soiled, but not torn, will be thus cleansed and re-issued. The advantages in favour of cleanliness and the public health are as enormous as the amount that will be annually saved to the public exchequer. In Ceylon (and in India) the economy to be effected would be less, partly because the note unit is higher than one dollar, but the sanitary argument would be all-powerful. The ultimate adoption of a similar process in Colombo would be well worth while. Even if it were discovered on test that our currency notes would have to be made of tougher material, this additional initial cost and the cost of one machine which is all that would be required, would be covered many times over. My visit to Washington will prove of benefit to the Colony if the Government will follow up this recommendation.

INQUIRIES AND CONCLUSIONS.

In the many discussions with American and Canadian manufacturers, the one subject never omitted was the lack of uniformity in plantation rubber, and consequent restriction in its use. Trade experts used various illustrations, the more to impress me with the great importance of this fact. One stated that the use of Mexican Guayule rubber by the group of factories in which he was interested rose from 100,000 lbs. to 750,000 lbs. per annum, solely because those engaged in supplying it succeeded in their attempts to secure uniformity. The increased consumption, I was assured, had nothing to do either with price or improved quality *per se*, but was due entirely to the users knowing what they were buying, and that their factory results would be uniform. It may be remarked here that it is the opinion that in two years the Guayule supply will be practically worked out; it is already much less than two years ago. Another gentleman stated that if our plantation output was 10 per cent. or 15 per cent. lower than our present best grades, and was uniform at that lower quality, the United States would at once want all we could supply. The United States has been taking about 45,000 tons of rubber in a year, of which in 1911, 6,590 tons were plantation. This quantity will be nearly doubled for 1912 and the annual figures should rapidly advance

until America takes say 35 to 40 per cent. of the annual output of the Middle East. It was considered that there would be a great improvement in evenness of quality as the trees matured, and as the outputs of the individual plantations became larger ; while manufacturers would also better understand plantation rubber. It was also complained that London dealers put together rubber from different estates and ship these collections in large packages that in a good many instances contained splinters of wood. Mr. Cyril Baxendale, as a practical planter, was convinced by instances brought to our notice that the interests of the producer were being distinctly damaged by some of the methods of the trade. He urged in Committee that the rubber should be sent forward in original cases, and also that all estates having a considerable output should brand their rubber. This subject has been frequently considered before, but its importance has never been thoroughly realized. Sheet rubber can be marked all over with the estate name while passing through the rollers in the estate factory ; but for crêpe a separate stamping machine is now being produced by a Manchester firm to a design by Mr. Baxendale who hopes to be able to induce Federated Malay States producers to stamp all their output without regard to any increased difficulties which dealers may at first have in filling large orders. The rubber boot and shoe industry—enormous in a country that is still in the making, and where most of the roads are deep in mud in bad weather—accounted for most of the rubber used in America until recently, when the demand for tyres took the lead, never to be overtaken by the humbler form of progression ! Most of the rubber used for footwear is reclaimed, and this is an enormous business, and probably far larger than manufacturers care to admit ; but those engaged in good class businesses all declare that when rubber falls 25 per cent. in price, more will be used to make a more durable article, whether it be a shoe, a mackintosh, or a hot water bottle. The trade term for reclaimed rubber is "shoddy," and experts cannot confound reclaimed rubber and unused rubber. It is tyre manufacture, where only a small percentage of reclaimed rubber can be used, that has maintained the crude rubber market in the strong position it is to-day ; and even in America the use of rubber tyres on commercial vehicles has been no more than touched hitherto. I wish to place on record two views which were expressed to me in detail. The first is by Mr. A. D. THORNTON, Managing Director of the Canadian Consolidated Rubber Company, Ltd., with its headquarters at Montreal, and possessing the biggest factory in the British Empire. I met him several times in the early days of the Exposition, and when he returned to Canada he sent me the following communication :—

Mr. A. D. THORNTON'S VIEWS.

My views regarding plantation rubbers are governed by my experience, so that anything I may write—for or against these rubbers—is absolutely without prejudice to the said rubbers or any one connected with the same.

Looking back at my records I find that in 1905 I began to use plantation rubber : it came in small quantities, but so handsome was it in appearance when compared with other kinds that we were delighted with it, and immediately began to use it. We were quite disappointed with the results, *it was not as good as it looked*, and up to that time rubber was bought on appearance only. With the aid of the laboratory, however, we found that there were ways of using it to advantage, which we did and have been doing

up to the present time. I am a great believer in plantation rubber, because I am forced to be. I am convinced that in a few years wild rubber will prove to be a very poor second. In the meantime, however, we have much to learn, both at the producing end and that of the consumer at the factory.

And so I must tell you what I want. This morning a broker offered me a parcel for first latex crêpe ; frankly, I did not know just what he was offering ; of course, I know the name, but I am not able up to the present time to commit to my *mind and memory any particular grade or style* of plantation rubber, which I would feel *sure of getting* if I buy first latex crêpe by name only, and fail to obtain a sample of each particular lot offered for sale, and so I want to *know* just what I am buying.

A great objection to this rubber is the way London importers, &c., handle it. During the year I received a 5-ton lot of biscuit and sheet from London. There were eight very distinct grades in the parcel—some smoked, some not, some crêpe, some sheet, some fairly strong, some very weak, some pale, and some dark—and the variation in vulcanization was simply astonishing. Of course, we refused the parcel ; it was quite out of the question. This kind of thing leaves a nasty taste, and one is liable to swear he would not use any more of it. Of several lots I have bought direct from Colombo I have never once had any trouble, and at this moment I feel it much to our advantage to buy that way. For that reason I am aiming to obtain some means of being able to know just what I am buying when I am offered a parcel by means of the cable.

As regards reclaimed rubber, I am not inclined to think that it can ever replace crude rubber. If we could return old rubber into its crude state the matter would be different, but it is as impossible as it is to turn bread into flour again. True it is used in vast quantities, but this is only an aid to crude rubber ; it does not *replace* crude rubber but it does replace chemical compounds, and it does thus enable us to make rubber goods at a price which is within the reach of all.

I do not think for a moment that crude rubber, even at an extremely low price will do away with reclaimed rubber, for we must bear in mind that scrap rubber has no value ; it is not produced, it is really rubbish. Its first value is fixed by the demand, so that old auto tyres if they were one cent per lb. instead of nine as at present would still be gathered by the scrap dealers, and should the time ever come that such prices prevail, the consumption of rubber goods would be enormously increased from what it is now.

As to the quantities of reclaimed rubber used, it would appear to me, after much consideration, that where 1 lb. of crude rubber is used that 1½ lb. of reclaimed rubber is also used, for while little or no reclaimed rubber is used in the highest grades, most of the low grades are loaded to the limit.

ANOTHER AMERICAN VIEW.

A New York gentleman, who wished to go unnamed, but whose position as arbiter as to what rubber is to to be used in the largest rubber manufactures' combine in the United States would not be disputed, put the matter thus :—

The American manufacturers in handling plantation grades have found that the greatest difficulty in their use is the lack of uniformity of quality; the rubber coming as it does from a number of plantations and delivered through London in the auctions is repacked, and though they attempt to keep colours uniform, the quality is not such. The lack of uniformity was discovered by various manufacturers making complaint in the past that one lot would work better than another, and upon examination it was found in tracing the shipments, that the poor lots, or those that did not work well, came from new estates, and that the rubber was weak. This in a way has been obviated by the trees becoming older and the latex better, also by the care which is taken in coagulating. The use of plantation grades was forced upon the manufacturers all of a sudden. Previous to 1909-10 they were experimenting in a small way with these grades, but the high values that were experienced in 1909-10 obliged all manufacturers to set their chemists to work to find a substitute for the then high prices of Para grades. These chemists have done more to promote the future of plantation grades than any one else and all manufacturers now have adopted the use of plantation grades to a greater extent to replace the Para and African grades or the wild rubber. The very fancy light coloured

crêpes are only used for special purposes. The manufacturers making a general line of goods give the preference, when price is in proportion to the medium, brown, or darker colours. To-day it is estimated that in the working of plantation grades they are worth to a manufacturer about 5 per cent. below the value of fine Para, but if this value could be at a uniform difference of, say 15 per cent., a greater amount of plantation grades would be used. To-day the preference is given to plantation grades; and wild rubber, including fine Para, but more especialy the African grades are being eliminated, and these eliminations will continue as long as the relative price between the plantation and African grades remains at present levels. The experience of the manufacturers with plantation grades is similar to that which was experienced with Guayule when it first made its appearance in this market. No manufacturer would use it in an experimental way on account of the condition in which it was arriving in the market. The quality then was very poor, but since then experiments have been made and the quality been brought to a higher standard, and all manufacturers readily take it and use it in their compounds to the extent that, say, in 1910 America alone was using some 13,000 tons. There is no doubt but what with the prominence that plantation grades are receiving and the great attention that is being paid to their betterment by the planters that they will experience the same betterment that was experienced by Guayule, and that when the production increases, as it is estimated it will increase, the future will see much more uniformity of quality and larger percentages used.

The American market can see at present why there is not a larger business done in these grades direct, not causing them to purchase through London. They understand that a great many of the companies have their home offices in London, and are required to ship their product through that market. A much larger business could be done if done direct; the cost of shipping to New York is estimated at 5 per cent. cheaper than shipping through London. In London heavy commissions are paid, rubber is required to be warehoused, sampled, and numerous other charges attached, which do not occur in this market. The only charges there would be on direct shipments to America would be freight, insurance, 1 per cent. commission for selling, and a small charge for weighing and custom-house entry, and the rubber upon arriving would be delivered *ex* dock with no store charges attached. If business could be done by purchasing at Colombo, Singapore or other Middle East markets at a f. o. b. price, the seller allowing the purchaser in this calculation a part of the saving over shipment through London, we have no doubt but that a greater and more profitable business could be done. America to-day uses the largest percentage of the output ot the Middle East, and it is equitable that they should not be required to make their purchases through London, and it would be more to the advantage of the plantation to sell them direct. You are aware that in this market there have been dealers who have misrepresented these grades. For instance, the output of the highland smoked sheets is only a small amount, while hundreds of tons of this grade is sold each year. It would be to the advantage of the plantations to brand their rubber in such a way as to prevent imitations being sold as the original article. It has been said by shipping in the original packages that this could be overcome and each estate's rubber being distinguished by the mark on the package. This would be in order if on direct shipment, but when shipment comes through London the various estates are mixed. We look upon it to be caused first by the small amounts that are being offered from each estate at the auctions, these lots are bought and packed, attention being paid only to quality and colour. The original packages from the Far East are too frail to allow the opening for tarring and recoopering for reshipment to America, and would not stand the voyage; for this reason the original packages are discarded and new packages much stronger and larger are made, so that it is very seldom that on shipments coming from London, the dealers receive the original packages as shipped from the Middle East.

THE RUBBER DISTRICT OF THE AMAZON.

IQUITOS RUBBER AND THE TRIBUTARY REGION.

The attention attracted to Iquitos and the Peruvian Amazon basin by the world-wide discussion of the methods of the Putumayo rubber gatherers adds interest, says *Peru To-day*, to a report of the American Consul at the important port, Mr. Stuart J. Euller, who returned to the United States last month after having completed a joint investigation of the Putumayo region with Mr. G. B. Mitchell, the British Consul, and Mr. Carlos Rey de Castro, the Peruvian Consul at Manaos, Brazil.

IQUITOS, THE CITY AND PORT.

Iquitos, the capital and principal town of the Department of Loreto, although it is 2,500 miles up the Amazon River from the sea, is only 348 feet above sea level. There is a difference in the level of the river here between high and low water of 30 to 40 feet. The climate is warm and moist, the average temperature being from 80° to 88° F., frequently running as high as 95° to 97° F, in the shade from July to December. The nights, however, are generally fairly cool. Rains are frequent and abundant, aggregating 60 to 75 inches in a year.

The population of Iquitos is variously estimated at 12,000 to 15,000. In March, April and May, when the rubber gatherers are not at work in the forests, it will run up to 20,000. This is double the population of ten years ago. The Department of Loreto, which includes most of trans-Andean Peru, has an estimated total area of 288,500 square miles. The population of this district has been estimated at 100,000 to 200,000.

LABOUR SCARCE: COST OF LIVING.

Labour in general is scarce and costly. The labour on the mole is imported from Portugal under contract, and there are a good many Barbadian labourers in and around Iquitos. Native labour runs more to the quicker and larger returns of rubber gathering, despite the danger and hardships of the life. It is estimated that there were more labourers at work collecting rubber in 1911 than in any previous year. The labour situation in the different river systems varies greatly, but in general it may be said that there are two methods of working large rubber properties.

The proprietor may let out sections of his land, called *estradas*, for a fixed rent or a share of the product. This will run to about £43 per *estrada* per annum. Supplies are advanced to the labourer and charged against his account, to be paid for when the rubber is brought in.

On account of the likelihood of the yearly tenant overtapping the trees, a more general rule is that of buying the rubber from the collector to whom the *estrada* has been assigned at a margin for profit instead of a rent or a share. Under this plan advances are also made, and the worker binds himself to get his supplies from the store of the employer. Under either plan the labourer starts the season in debt to his employer.

The food of the district is almost entirely supplied by imports of canned goods, flour, potatoes, onions, butter, oils, beans, rice, etc., from Europe and the United States, and import duties on the foodstuffs are high. The retail provision trade is largely in the hands of Chinese.

There is more high ground in the district tributary to Iquitos than farther down the river in Brazil, but local food production is confined to coarse plantains, cassava root, and a smoked river fish *(paiche)* consumed by the labouring classes. From 100 to 160 head of cattle are brought down each month from Yurimaguas, on the Huallaga, and small amounts of fresh beef can be obtained at about 35 cents a pound. Chickens, ducks, turkeys, and eggs are scarce and expensive. Limited quantities of fresh milk can be obtained in Iquitos itself.

Weekly expenses for a family of four, including groceries and washing, but exclusive of rent, clothes, servants, etc., will come to about £12. Servants cost about the same as in cities of the United States.

Local prices depend very little on cost and mostly on the available supply. Steamers arrive one in a month or six weeks; and if they are delayed or stranded on their 2,500-mile trip up the Amazon, an occurrence by no means unusual, prices soar. Flour, for example, sometimes sells below cost, and at other times has gone as high as £5 and £6 per barrel.

METHODS OF GATHERING RUBBER.

The rubber produced in this district is classified as *Jebe* and *caucho*. *Jebe* is divided into lowland—fine (smoked), entre fine (smoked), and scrappy (not smoked), and highland weak fine (smoked) and weak scrappy (not smoked.) *Caucho* is divided into ball and slab. *Jebe* is obtained from the *Hevea braziliensis*, trees which grow close enough together to enable the worker to handle a group of 100 trees, called an *estrada*, or walk, a day visiting and tapping them. One man can manage two *estradas* on alternate days.

The rubber worker builds his hut within easy reach of the river and visits the trees in the early morning, returning about 2 o'clock in the afternoon with a pail full of milk (latex) to smoke and work into balls. The quality of the *Jebe* varies according to soil and method of preparation. If grown on land high enough not to be flooded, it is weak, though it may be fine; i. e., it has a fine texture but breaks at a lower strain than that grown on periodically submerged land, which is known as fine, without the qualification weak. Entre fine is lowland rubber, but not so well prepared as the fine. *Sernambee*, or scrappy, is from milk which has coagulated without being smoked, and is more brittle.

Caucho comes from the *Ficus elastica*, which grows scattered and solitary in the forest, usually on the higher land and at some distance from the rivers. The tree is not tapped, but is cut down, and the sap runs out to form a pool in a hollow in the ground or in a bowl or basin. It coagulates without smoking, and the working up is thus easier. The *Cauchero's* camp is therefore movable, and he is always on the look out for trees.

The *caucho* in the rivers to the northward of Iquitos has come to be pretty well worked out, and many of the caucheros who previously worked there have gone to the Madre de Dios and other southern regions. Ball

or "*Sernambee de caucho*," is *caucho* that has been coagulated without any treatment and then cut into strips and the strips wound into balls. Slab is *caucho* coagulated without smoking by a special process which involves mixing it with a kind of green liana, soap, or other diluents. Very little slab is now worked, owing to its heavy shrinkage, and it constituted only 1.9 per cent. of the total rubber export from Iquitos in 1911.

PRODUCTION OF THE VARIOUS SECTIONS.

From the Javary River district comes fine, weak fine, weak scrappy, and ball rubber. The product is mostly fine. The *caucho* is fairly well worked out there. From the Ucayali the rubber is almost entirely fine or scrappy, practically no weak coming down. The *caucho* is pretty well worked out in this river valley, too, but some comes down from the upper reaches of the Madre de Dios via the Sepahua, a tributary of the Ucayali, and some also from the Jurura. From the Tapiche come small quantities of ball but mostly fine and scrappy. The rubber from the Huallaga is almost all weak, both weak fine and weak scrappy, and almost no ball comes down this river.

Turning to the north, the *caucho* in the Napo and Tigre, which were once great sources for ball, is pretty well worked out, though considerable *caucho* is still available in the Ecuadorian reaches of the Napo. The rubber from the Putumayo district is called Putumayo "tails." It is prepared in a different way from that in other rivers and has a different appearance. This rubber is classed by the shippers as weak fine, and declared at the customs as such, but it greatly resembles ball, and is at best generally regarded as inferior weak fine.

Not much rubber comes in directly from the Marañòn, but what is found there includes all the grades of *caucho* and the weak varieties of *jebe*.

The rubber season of 1911 was far from being good. Production was decidedly insufficient, owing to the heavy rains which prevented collection. The usual collecting season lasts from July until February, but in 1911 the flooding of the low-lying land where the trees are found largely put a stop to work in November. There was also a scarcity of labour. Prices were low and with the heavy taxation, trade in Iquitos was a serious problem.

RUBBER TAXATION AND PRICES.

The question of the taxation of rubber is a vital one in the district. The export duty is fixed af 8 *per cent ad valorem*, calculated on the selling price at Liverpool, which is telegraphed to Lima and from Lima to Iquitos. It is levied in gold in advance. As a shipment is four to six weeks reaching the market, the shipper has to sell at a price that may be totally different from the one on the basis of which duty was paid. The price on which the export duty is based also includes packing, insurance, etc. There is a strong local demand for a lowering of this tax.

PRESENT CONDITION AND PROSPECTS.

Though local views of the future of Peruvian rubber are somewhat conflicting, it is generally felt that the quality is so good that it can hold its own against the production of other regions, particularly in cultivated rubber. As to quantity, the available supply is locally regarded as practically

inexhaustible. The business system pursued makes it difficult to estimate the minimum cost of delivering raw rubber at Iquitos. So long as the price in the world market is 4 shillings per pound, however, it is figured that the Peruvian article can compete successfully.

The methods used in the extraction and working up of the latex are regarded as fairly good. There is, however, room for improvement in the elimination of impurities. All the Amazon rubber must be washed before it is used in the processes of manufacture, Peruvian fine losing 12 to 20 per cent. and scrappy 25 to 50 per cent. on account of their moisture content. Straining the latex and more thoroughly washing and drying the product before exportation would lessen freights and duties, both of which are heavy.

It is locally figured that the world's production of rubber will not begin to overtake the demand until 1916, despite the rapid increase in plantation production, and so it is calculated that the price will continue for at least four years more at a level that will admit the Amazon rubber to competition, despite the increasing cost of collection here, due to high labour and high cost of living.

Advances to collectors for the 1912 season were based on an anticipated fall in price. The water in the rivers was falling rapidly in June, and in some districts collectors had already started work by June to which is considered early.

The export of rubber for the first six months of 1912 reached a total of 2,975,355 pounds, a larger amount than was exported in the corresponding period in any year since 1907 and nearly as much as in that year. It is 45 per cent. more than the export for the first six months of 1911, which was the worst year since 1904.

Not a great deal has been done towards encouraging and developing the cultivation of rubber. A few private experiments are being made and the Government pays a premium of 50 centavos (1s.) per tree. The high cost of labour and slow returns have combined so far to prevent much being done in this line.

RUBBER IN THE ORIENT AND ON THE AMAZON.

THE AKERS COMMISSION.

The India Rubber Journal contains a lengthy account on the Akers Commission from which we take the following:—

A considerable amount of interest has been evoked in trade circles by the appearance of the two reports of the Akers Commission, one dealing with the rubber industry in the Orient and the other with the rubber resources of the Amazon Valley.

The Commission was appointed by the important financial group identified with the Port of Para, the Booth Steamship Company, and other enterprises closely associated with the trade of the Amazon Valley, and pursued its investigations first in the East and then on the Amazon.

The Commission commenced its work on the Lower Amazon, and proceeded up river. An account is given of the position and prospects of the industry in each section of the country.

GIRTH AND HEIGHT OF RUBBER TREES ON THE AMAZON.

On the Lower Amazon the girth of trees of over thirty years of age varies from 40 to 150 inches at three feet from the ground; but, with the exception of those on the river Xingu, where one specimen was found measuring 207 inches, few exceeded the latter size. These trees varied from 50 to 80 feet in height approximately, but there were no means of taking accurate measurements. In the upper section of the Amazon Valley on the banks of the Madeira 150 inches in circumference at three feet from the ground was of common occurrence, and one giant measured 199 inches. The height of the trees was frequently 120 feet as far as could be gauged. On the Purus river also many big specimens are found of from 130 inches to 170 inches in girth.

AGE OF TREES.

It is not possible to obtain accurate data as to the age of the bigger trees. Many of these rubber properties have been worked for the past fifty years, and a large number of trees have been tapped for that length of time, and as a forest grown rubber tree takes quite twenty years to mature, it is reasonable to suppose that a fair proportion of these older properties are over seventy years old. In many cases they must exceed this age, and may easily be 100 years and upwards.

FAVOURITE LOCALITIES FOR WILD RUBBER.

While the different varieties of Hevea are found scattered through wild areas adjoining the Amazon and the tributary rivers, its favourite localities are near the banks of rivers and streams. The trees are no better grown near the waterways than on higher land, but without question they are more abundant. This may be accounted for to some extent by the seed being carried along the banks in flood time, and germinated in the alluvial deposit remaining after subsidence of the waters, and also by the greater moisture in such places to assist the young seedling in its first struggle for life. Castilloa is found only on high dry lands away from the rivers.

GENERAL CONDITION OF THE TREES.

With the system of tapping in vogue in Brazil one does not expect to find the trees in good condition. It is astonishing, however, to see how well they have resisted the ravages of the collectors who are merciless in the use of the axe throughout the greater part of the rubber bearing districts of the Amazon Valley. The older trees are hacked about in most disastrous fashion from the base to a height of six to ten feet from the ground. In many instances the hacking process has been continued for some fifteen feet up into the tree. Naturally the trunks have become a mass of wooden warts with only a thin covering of bark. No time has been allowed for the healing of the wounds so ruthlessly inflicted, and the only remedy now is the careful handling of such trees as can be tapped systematically, and the partial resting of others for several years. Scientific overhead tapping is still possible in many districts, and this and the opening up of next trees must be the source of the bulk of the latex for the next few years. In the districts

of the Madeira the trees are in far better condition than elsewhere, and here with judicious treatment a very great improvement can be effected in a comparatively short period. With this overhead working should be combined small V-shaped tapping on the lower part of the trunk wherever opportunity offers, and with due regard to a distribution of the surface for the next two or three years.

DISEASES COMMON IN THE AMAZON VALLEY.

In all districts evidences of white ants (*termes*) were plentiful, and many cases of borer were seen on trees where the cambium had been hacked through by the use of the machadinho. There is also a red ant (*Aecodoma cephaltoes*) which does considerable damage, especially to young plants. Another common disease is a lack of strength in the latex cells to hold the milk and a constant exudation to the surface, where it rots on the outside bark. This infirmity is explained as being due to the rough treatment the cells have received in former years, and the fact that they have only partially recovered from the wounds inflicted by the collectors' axe, probably this trouble would be reduced to a very great extent if the trees were given more air and light.

In many districts a parasitical growth, not unlike mistletoe, was found on the trees, and this is difficult to eradicate owing to its growth on the upper branches where it cannot be reached with ordinary appliances.

On the whole the health of the trees is remarkably good, especially when the treatment they have received in the past is considered.

HOW THE RUBBER PROPERTIES ARE WORKED.

The lands containing the wild rubber trees are divided into sections known as estradas, each containing as a rule from 120 to 150 trees, the number depending upon the proximity of the trees to one another. These trees are connected by paths cut through the jungle—hence the name of *estrada*, the Portuguese for a road. A collector is allotted one or more estradas, and becomes a partner with the proprietor, receiving a varying share of the value of the rubber he delivers in accordance with the established custom of the district where he works.

His obligation is to tap and collect the latex, coagulate it by smoking, and deliver it to the owner at the homestead. He is obliged to purchase his supplies from the proprietor's store. The cleaning of the paths from tree to tree is done at the expense of the owner of the property.

ADMINISTRATION.

The administration is in the hands of the owner or a manager appointed to safeguard his interests. The duties consist of keeping the books of the store, recording the amount of rubber received from the collectors, and rendering an account to them from time to time. The administrator is supposed to inspect the estradas and endeavour to prevent the collectors inflicting unnecessary injury to the trees, and in this work he has the assistance of one or more headmen. In a very large proportion of the properties this duty is neglected, and care only taken to prevent rubber being stolen for sale elsewhere.

BRAZILIAN METHOD OF TAPPING.

The universal system in use for tapping rubber trees in the Amazon Valley is with the small axe, the *machadinho*, as it is called in Portuguese. In the most skilful hands it is at best a crude and unprofitable method of opening the latex cells, and when employed by the average Brazilian rubber collector the most serious damage to the trees in the present, and the total extinction of the industry in the future, is inevitable. The procedure is as follows :—The collector sets out with his axe shortly before daylight and makes the round of the estradas allotted to him. From each tree he gathers the scrap (sernamby) and inflicts a series of gashes on the trunk, affixing a tin cup under the wound to receive the latex. On large girthed trees as many as four or five cups are so inserted into the bark. After completing the round of his trees the collector returns for a second visit about 9 a.m. to empty the latex caught in the cups into a tin of about one gallon capacity, and this he carries to his hut where he sets about the work of coagulation by the smoking process hereafter described. The operation would appear at first sight to be inocuous and simple, but the result is disastrous.

At every stroke of the axe the cambium is penetrated, leaving the tree a prey to the deadly borer and the destructive white ant. Moreover, these gashes in a very short time transform the trunk into a mass of knots and warts half the size of a man's fist, and over these only a thin covering of renewed bark is formed in the course of the next year or two. This fresh bark is hacked away again as soon as it is capable of yielding latex, and long before the cells have had time to regain their proper strength,. Naturally the trees suffer from the practice of such crude and ruthless methods, and the yield of latex diminishes until they are abandoned for a series of years as barren, and then those that recover are subjected once more to similar treatment. Practically the only method Mr. Akers can suggest to meet this condition of affairs is to prohibit by law the use of the machadinho on the rubber properties, and to make each offence punishable by fine or other means of correction. Nothing short of some such drastic measure will serve to meet the case for the owners are too supine by nature to make a strong stand against the existing destructive method. With a farrier's knife or a gouge the collector could not do one-tenth of the damage now inflicted unless he wilfully set out to do so, and in that case it would be easy to deal with him.

Any labourer of ordinary intelligence, and these collectors are by no means lacking in intelligence, can learn the use of farrier's knife and gouge in a few days, and once it was seen that the new method gave better results and enabled work to be continued year in and year out upon the same trees the use of the machadinho would be relegated to the category of out-of-date usage and soon regarded as a relic of antiquity.

The collectors provide their own huts to live in, and also the nuts required as fuel for smoking the latex. The tapping season begins in June, and lasts until January or February, when heavy rains and annual floods top all work in most districts.

YIELD OF TREES.

To state with accuracy the average yield at any given age of the Hevea braziliensis in the Amazon Valley is impossible owing to the fact that no records have been kept in the past. Mr. Akers has, however, worked out very carefully the total outputs compared to the total number of trees on various properties on the river Madeira, and the result obtained is approximately an average yield of 7 lb. per tree. On the Purus River the average works out at a much lower figure, and is 4 lb. approximately; this figure was also obtained in connection with the Lower Amazon districts. It must be borne in mind, however, the number of trees included all growing on the properties, no deduction being made for those not being tapped or abandoned, and probably these would represent 35 per cent. on account of bad usage or other causes. It is considered, therefore, that the average yield per tree under tapping in the Amazon Valley is not less than 7 lbs. with the application of the existing crude methods, and Mr. Akers is confident that within three years this yield can be doubled if the machadinho is abolished and substituted by the farrier's knife or gouge under proper instruction in the system employed in the Orient. The superiority of the returns from the River Madeira districts are due to the better condition of the trees, a slightly richer quality on soil, and a closer supervision over the collectors during their work. It must be remembered that the tapping season extends over some six or seven months only, beginning in January or February.

PREPARATION OF THE LATEX AFTER COLLECTION.

After the collection of the latex in the early morning it is brought to the smoking hut, a small temporary shack of palm leaves built by the collector. In the centre is a hole of 18 inches cubic measurement, with a small open cut at the side acting as an air flue. Over this hole is placed an open hollow bell-shaped funnel of earthenware or tin, the small open end being uppermost, and through this orifice the smoke percolates in a thick volume. The fuel used is the nut of the Urucury palm, found in the surrounding forests, although occasionally wood is used when these nuts are not available. The collector sits on a stool with a basin of latex at his side, and with the half shell of a gourd pours a little of the milk on to the end of a round stick, or the broad end of a paddle when the latter is used. The stick is then revolved by hand slowly in the smoke, and the milk is coagulated by the action of the carbonic acid contained in the fumes. When large balls of rubber are made the stick or paddle is suspended in a loop from the rafters of the hut or turned on parallel bars so placed as to allow the action of rolling backwards and forwards in the smoke. As each sprinkling of latex is set, a little more is poured upon the stick, and so the process continues until the day's harvest is finished. The balls made in this manner are generally of the required size in one or two weeks, dependent on whether they are to be of large or medium dimensions, and they vary in weight from 10 to 100 pounds or more. When completed they are detached from the stick by simply pulling away the rubber, but in the case of a paddle a cut is made across the bottom and through this the broad end and handle is abstracted. The rubber is delivered weekly or fortnightly to the proprietor, and generally retained by him for nearly a month before weighing to allow some of the moisture to dry

out. From time to time the rubber is shipped, without boxing, to Manaso or Para for sale. At the end of the season accounts are settled with the collectors, who meanwhile are allowed what credit they require at the store.

This crude process of preparation occupies the collector from two to three hours daily, and, in addition, he has to spend considerable time in securing the necessary fuel. In a country where manual labour is so costly as is the case in Brazil, it is clear that reform is necessary in the coagulation of the latex.

Little attention is paid to the scrap (sernamby) by the collectors. It is brought in and thrown into a heap on the mud floor, and soon passes into semi-putrid condition. Eventually it is rolled up into bundles without any effort to clean it and so delivered to the owner and shipped to market. The loss of scrap is heavy, for a large proportion is left on the trees, as Mr. Akers vouches for by personal observation. Proper supervision only is required to remedy this very wasteful procedure.

CLIMATIC CONDITIONS.

The Amazon Valley year is divided into the dry and wet seasons. The former commences in May and ends in the middle of November, the latter beginning in November and lasting until the end of April or the early days of May. In the so-called dry season heavy showers are experienced in September and October, this rainfall occurring, as a rule, in the afternoons or evenings. Accurate statistics of weather conditions over this vast area of territory are not available, but the average may be taken at approximately 100 inches per annum.

The temperature shows considerable variation between day and night, the period of greatest heat being from noon to 5 p.m. The nights, mornings and evenings are cool and pleasant, the thermometer frequently falling to 70° F. The average temperature in the State of Para is stated to be maximum 89° and minimum 7° F. In the upper rivers the maximum and minimum are given respectively as 85·7° and 67·5° F, but these figures are not vouched for.

POULTRY

POULTRY LAYING COMPETITION.

During the fourth period of four weeks the 600 pullets entered in the above competition have laid 6,760 eggs. The results, as compared with last month's figures, show very little change in the position of the six leading pens. Pen No. 86 (Buff Rocks) still retains the lead with a total of 362 eggs, amounting in value to £2 5s. 8½d.; and is closely followed by Pen No. 60 (White Wyandottes) , of which the total amounts to 350 eggs, of the value of £2. 7s. 4d.

The highest score for the month stands to the credit of Pen 29 (White Wyandottes) , which produced 121 eggs, valued at 12s. 3½d. The birds in this pen have laid well throughout the month but have lost points through the inferior size of the eggs.

The White Wyandottes in Pens No. 32 and 45 retain the same positions as they held last month, viz., third and fourth respectively, but Pen 24 (Black Leghorns)has changed places with Pen 80 (Buff Orpingtons).

The best individual record has been made by Buff Orpington No. 452, with a total of 25 eggs in 28 days ; of these eighteen ranked as first grade and seven as second grade. Good records have also been made by Buff Orpington No. 451 in the same pen as No. 452, by the White Wyandotte No. 276 and the Buff Rock No. 537, which have each laid 24 eggs during the four weeks.

During the period under review the weather has been the wettest experienced since the commencement of the competition, the temperature has been low and there has been a certain amount of fog. These conditions have proved unfavourable and have made it difficult to keep the birds dry.

The light breeds have been affected by the weather to a far greater extent than the heavy breeds and have taken a much longer time to resume laying

The health of the competing pens throughout the period has been good, and no deaths have occurred.—JOURNAL OF THE BOARD OF AGRICULTURE.

POULTRY EXPERIMENTS IN AMERICA.

The following extract is from *Circular No 118* of the Ohio Agricultural Experiment Station, which relates to a co-operative investigation on the profitableness of poultry when kept under farm conditions.

The investigations concerned flocks kept in the city and penned throughout the year, flocks located in suburbs with limited range, and flocks on the farm with unlimited range. The co-operators were located in thirty-six counties of the State, and represented widely varying phases of the poultry industry.

In conducting the experiment, each flock was inventoried at the beginning and again at the end of the year, and each co-operator was furnished with a pad of twenty-four blank forms so that a duplicate record for each month might be kept; one of these records was sent to the station and one was retained by the owner of the flock. The forms provided for a statement of summaries, so that the totals from the monthly records might be carried forward, and one copy of the summary was sent to the station at the end of the year in order to check the monthly return sheets of the flock. Average results per annum were as follows:—

Average Results per annum from 18 Flocks Kept on Farms:—

	No. of fowls.	Eggs per Hen.	Value of Equipment.	Labour Cost per Fowl.	Feed Cost per Fowl.	Value Eggs Sold.	Value Poultry Sold.	Total Cash Recpts.
Average	121	71	£. s. d. 13. 13 4.	s. d. 1. 2.	s. d. 2. 6.	£. s. 25 4.	£. s. d. 9. 10 3.	£. s. 34. 15.

	Eggs Used.		Poultry Used.		Profit per Fowl.
	No.	Value.	No.	Value.	
Average.	1,056	£. s. d. 3 16. 8.	28	£. s. d. 2. 17. 4.	s. d. 3. 7.

Average Results p.a. from 12 Town Flocks kept wholly or partially confined:—

	No. of Fowls.	Eggs per Hen.	Value of Equipment.	Labour Cost per Fowl.	Feed Cost per Fowl.	Value Eggs Sold.	Value Poultry Sold.	Total Cash Recpts.
Average.	46	70	£. s. d. 18. 8. 10.	s. d. 2. 6.	4s.	£. s. d. 5. 12. 4.	£. s. 6. 2.	£. s. d. 14. 14. 3.

	Eggs Used.		Poultry Used.		Profit per Fowl.
	No.	Value.	No.	Value.	
Average.	916.	£. s. d. 3. 9. 10.	21	£. s. d. 2. 1. 5.	s. d. 1. 6.

The result of the investigation showed that:—

1. Both in town and country small flocks have greater profits than large flocks.
2. Flocks with unlimited range produced better profits than flocks partly or wholly confined.
3. Farm flocks were more profitable than village or city flocks.

COLLEGE OF TROPICAL AGRICULTURE FOR CEYLON.

SUPPORT BY "TROPICAL LIFE."

AWAY back in 1909, when, as now, we were urging the claims of the London school of Tropical Medicine by publishing a series of articles on the benefits they were conferring on the Tropics, we wrote as follows in the direct appeal for subscriptions which we published, at the head of each article:—"The trade of this country needs extending; we are told that we are already the heaviest taxed nation on earth, whilst it seems doubtful if we are the wealthiest. We hear a good deal about the necessity of 'broadening the basis of taxation,' but far too little about broadening the basis of earning the money out of which the increased taxation is to be paid." If these remarks were true four years ago they are doubly true to-day when, as we stated last month, the ratio of taxation and the cost of living generally is increasing more rapidly than the income of wage-earners and many others. The middle and upper-middle classes must be especially hard hit just now but, fortunately for them, they have the Tropics to turn to, and the brains energy and enterprise to develop the resources of these wonderful centres containing incalulable riches, which in the aggregate would cause the contents of Aladdin's cave to take quite a back seat, or, if such a phrase savours too much of "slang," to occupy quite a minor position in comparison.

Like Aladdin's cave, however, these riches are inaccessible to all but those who have the password, which in the modern tale becomes "experience." To obtain this magic word has, like the fairy-tale, caused the death of some and brought serious loss and grievous disappointment to others. Hitherto we have been content to leave it too much to chance or luck (coupled always with great enterprise and perseverance), but of late years those setting out to find these riches have realized that they run far more chance of securing them if they go equipped for the task, that is, in plain English, if they first educate themselves to become tropical experts.

Knowing this from our own experience, and realizing where we fell short when we made the quest, we have always been keen advocates for training young men in the Tropics, as well as on this side, to enable them to obtain that experience without which they can never, taken as a whole (for the exceptions who do so only go to prove the rule), expect the Tropics to "open sesame" and allow them to secure the riches stowed away inside.

THE NEED OF AGRICULTURAL COLLEGES IN THE TROPICS.

JOHN BULL AND HIS NUTS.

Fingers 'tis truly said, were made before forks, and teeth before nut-crackers, so likewise did our forefathers plough with a bent stick; but he who uses such things to-day will make but slow progress compared with his neighbours, for teeth break, and a bent stick is but a sorry implement with which to cultivate.- *Anon.*

THE EDITOR OF "TROPICAL LIFE" to John Bull :—"Come I say John, are not such ways rather primitive? Try one of these; they will give you what you want much more quickly and easily, and save you money in the end."

For a time we cried alone in the wilderness. Then Professor Dunstan gave us a lead by contributing his now well-known introduction to our book on "Soil and Plant Sanitation," in which he referred to our articles and suggestions on the matter. Now we have many friends; and this year, although not two months old at the time of writing (February 26th), has caused that good friend of the Tropics, the London *Times*, to publish a leading article (on January 23rd) and two important letters: (1) by Colonel Arnold, on February 3rd,; (2) by Mr. John McConnell,* on February 14th, urging the establishment of such colleges.

Those, therefore, who remember what we have said, or who will take the trouble to refer back to these contributions on the subject, will be glad to know that the article and letters in *The Times* confirm and support all we have urged on behalf of establishing one or more Agricultural Colleges in the Tropics.† At the risk of greatly exceeding the space we usually allocate to our leading article, we would draw our readers' attention to the following, so that the many friends abroad who are fighting with us to get agricultural colleges established in Ceylon, West Indies, Malaya, and Australasia, will see how far we have got in the matter. "We are glad to learn," says *The Times*, "that the matter has, we believe, attained the qualified success of receiving official consideration;" we can confirm this statement as regards the Colonial Office, and also because, on sending a copy of TROPICAL LIFE for January, 1911, to our present King, we received an acknowledgment, as stated in the February issue of that year, p. 22, as follows: "The paper has been laid before the King, and I am commanded to thank you for same." In their leader of January 23rd, which discusses Mr. Norman Lamont's‡ book, "Problems of the Antilles," we were told: "By failing to establish such a system (*i.e.*, a rational system of tropical agriculture) we are on the one hand wasting an enormously valuable asset, and on the other hand, stunting the expansion of industrial and social activity at home. Now, the greatest obstacle in the way of those who try to develop a tropical country is the want of men trained to deal with agricultural conditions at home. . . . The most accomplished agriculturist in this country, if called upon to deal with

* Who represented the British Cotton Growing Association at the West Indian Agricultural Congress last year; see TROPICAL LIFE for March, 1912, with portrait group of the delegates, in which Mr. McConnell is seen on the extreme right of the front row who are sitting.

† As, for instance, "An Imperial Department and Bureau of Agriculture," March, 1909; "The Question of Agricultural Education," October, 1909: "The Need of a Bureau for the Distribution of Agricultural Literature" (September, 1910), and also a paper read before the London (1911) Rubber Congress; our own remarks on the need of more assured means of securing a tropical agricultural training in our book on "Soil and Plant Sanitation"; "A Tropical Memorial to King Edward VII, *i.e.*, a Tropial Agricultural College," January, 1911; "A Lectureship in Tropical Agriculture," January, 1912; "The Need of Organization in Tropical Agricultural Education," March, 1912; "The Trinidad (B.W.I.) Press on the Need of a Tropical Agricultural College," also March, 1912; "Agricultural Education," April 1912; "A University Education for the Tropics and Colonies," May, 1912; "The Establishment of Tropical Agricultural Colleges in the Tropics," July 1912. These articles have been reproduced, favourably criticized, or recommended as deserving attention by the financial papers on this side and the press abroad.

‡ Mr. Lamont was "Our Friend" in April, 1906, whilst M.P. for Bute and Private Secretary to the then Prime Minister (Sir H. Campbell-Bannerman). According to the *West India Committee Circular*, Mr. Lamont first advocated a Tropical Agricultural College for the West Indies in 1902.

tropical crops, would find himself obliged to start again at the beginning. . . . A University of Tropical Agriculture ought obviously to be situated where the students will live and work in tropical conditions." Colonel Arnold wrote a letter, published on February 3rd, congratulating *The Times*, as we do, on this article, and confirming what we claimed, for agriculture, as compared with mineral seeking, in our letter to the *Westminster Gazette*. "The prosperity springing from such (mineral) wealth," Colonel Arnold continues, "eventually becomes more or less dependent upon a simultaneous development of the agricultural resources of the country.* This applies even more to tropical territories than to more temperate ones. . . . A standard is required . . . (otherwise) the farmer in the Tropics . . . must spend many weary years in experimental work. A university appears to be indicated as the only remedy. A university duly organized would not only train men, but would collect and collate the scientific results of its own and other experiments." Finally, Mr. McConnell says, in his letter published Febuary 14th: "If it can be shown that the production of cotton in the Empire would be helped by a tropical university, the need for such a institution is confirmed," . . . and he confirms it by stating: "The cause of failure (to increase the output of British-grown cotton) both in India and elsewhere, lies in the want of opportunity for scientific study. The place where the British Cotton Growing Association has achieved its chief success is the West Indies, and there the success is largely due to the scientific work of the Agricultural Department of those islands. In face of this, surely, concludes the writer, "it is the duty of Great Britain, which controls so large a portion of the Tropics, to study the laws by which the untold wealth of tropical agriculture may be made available."

"In face of the way in which these letters and the *Times* leader are supporting what the *Times of Ceylon*, *The Ceylon Observer*,† the West Indian Press and individuals in all parts of the Empire are urging, we feel one university at least should shortly be decided on for the Tropics. In conclusion, therefore, we would say that now a start has been made there must be no turning back,‡ but all, working to bring this about, must continue to press forward until the foundation-stone of one, at least, of these four "Dreadnoughts" of tropical agriculture have been well and truly laid, and the income assured. This done, the benefits that will accrue from it will, we feel sure, soon lead to the establishment of the others.

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* As the Amazona Valley is, to its loss, as regards the mining of Black Gold, *i.e.*, in securing the rubber there.

† Tropical agriculture, like Tropical medicine, wants specialization, said a writer in his paper.

‡ In answer to a remark in the *Ceylon Observer*, we agree with that paper and Professor Dunstan that, if there is to be only one university to start with, Ceylon certainly ought to be chosen. We are equally certain that the second institution should be in the West Indies, preferably Trinidad, as the soil and climatic conditions generally of that island would, we believe, be found preferable to Barbados, which should otherwise be chosen, if only as the older colony.

Both those in favour of establishing agricultural colleges in the Tropics, as well as others who, up to now, have not given the matter their consideration, should note that during the month of January we had six inquiries for the name and address of a college or institution at which tropical agriculture could be studied wholly or partially. To our regret we could not answer these inquiries as decisively and satisfactorily as we would have wished. The following is a copy of the last inquiry to hand and our answer to same:—

"London, January 27, 1913.

"Sir,—We have an inquiry from one of our friends to know where he could find a college at which to study tropical agriculture, so that he might attend same, and receive a certain amount of instruction."

To this we replied: "The best thing one can do at present is to get into contact with those who lay themselves out to give boys a special training for a Colonial and tropical life. We hope one day to see agricultural colleges established in Ceylon, the West Indies, Federated Malay States, and Australasia ; until we get such colleges we suggest that you communicate with ——— "Tropical Life."

AGRICULTURAL EDUCATION IN JAVA.

By M. BARROWCLIFF.

A few words only suffice to indicate the importance to Java of her agricultural industries. Having an area, partly mountainous, of roughly 50,000 square miles, this suffices to support a population of over 30,000 ; 600 to the square mile.

In addition to the enormous quantity of rice required by the population, of which all but a small proportion is home grown, there are produced annually 1,400,000 tons of sugar, 41,000 tons of tobacco, coffee 16,000 tons, tea 12,500 tons, cinchona bark 10,000 tons, besides rubber, copra, cocoa, pepper, &c., in the exploitation of which are invested large amounts of European capital.

It is not surprising therefore that the Dutch authorities have considered it essential to establish in Java a large and well organized Agricultural Department, or, in view of the fact that the scientific work required for the great export industries under European control is mainly carried out in experiment stations financed by the planters themselves, that the work of a large proportion of the staff of the Department is directed towards the improvement of the agriculture of the natives, to enable the land to meet better the needs of the large and growing population on whose numbers and well being the prosperity of the country so largely depends.

The earliest educational institution established was the "Agricultural School," in which the instruction given is mainly theoretical, and unaccompanied by practical field works. This however was found unsatisfactory, the youths turned out evincing little desire to return to the sawahs and usually taking up less strenuous careers.

CULTURE SCHOOL METHODS.

On the other hand the "Culture School" at Buitenzorg, in which are some fifty students mostly supported by Government, and mainly sons of well-to-do native cultivators and Eurasians wishing to qualify for posts of some responsibility on the plantations, met with unqualified success. The course is one of 3 years and the curriculum essentially practical in its character. Attached to the school are some 12 acres of land on which the students themselves work daily from 6 to 9 a.m.

Here may be seen in progress experiments on the effects of cultivation, rotation of crops, green manuring, fertilisers, the respective merits of planting padi broadcast and from dry and wet nurseries, the cultivation of "second crops" such as sugar, tapioca, maize, the earth-nut, fodder grasses, soy beans and other legumes, etc.: whilst close at hand is the experimental station for seed distribution, the work of which—to be presently indicated—comes within the purview of the students also.

After the morning's work in the fields is finished classes in arithmetic elementary science, geography and simple book-keeping are attended.

As goes almost without saying the field work is carried out on a commercial basis and strict account kept of the factors entering into cost of production, so that the merits of different crops and different modes of procedure may be subsequently reducible to terms of cash.

The success met with by this system justified it being made the basis of future development. The influence of a single institution such as this must, amongst a native population, necessarily radiate extremely slowly, and for many years to come be appreciable only in the neighbourhood.

It was therefore decided to establish similar experiment stations in every part of the country, at which should be carried out practical demonstrations of the nature outlined above. To carry this out there were appointed for Java alone 12 agricultural instructors, men trained in the Agricultural Colleges of Holland.

Each of these instructors has a district of an average area of 4,000 square miles, in different portions of which experiment plots are being established.

The main lines on which the work is being carried out are:—

(1). The improvement by selection of the native varieties of padi and the introduction of new varieties obtained from the seed distribution station.

(2). The growing of "second crops."

(3). The use of fertilizers

with similar demonstrations to those recounted in connection with the Culture-School of the values of various methods of cultivation.

Most of the land required is obtained from the natives on terms by which they carry out the work and receive the produce, being paid however when necessary for additional work not coming within the routine of the usual agricultural operations. In some instances the land is presented by the neighbouring planters.

The actual experimental plots for the padi cultivation are usually quite small, 25-30 feet square, but the possibility of misleading results being obtained due to localised differences in the soil are reduced by the repetition of each experiment in several parts of the field. By this means the usual size of the "farm," from 10-15 acres is sufficient for a large number of trials to be carried out.

EXPERIMENTAL WORK.

A native house is acquired close at hand which serves as a laboratory for carrying out germination tests, weighings, etc., as an office for keeping the records required in the work of seed selection, and as a store house for the samples. The routine duties here are carried out by selected native youths paid at the current labour wage, 10 gulden per mensem, the more capable of whom are destined to become teachers when the contemplated extension of the system to the elementary schools is effected.

The instructor is responsible to the Director of Agriculture alone and is given a free hand in the choice of his methods and arrangement of his experiments. In addition to the actual field work he visits other parts of the district and arranges discussion with the local cultivators, telling them of his experiments and endeavouring to induce them to make trials also.

This is the keynote of the system,—to awaken an interest in experimentation and to indicate on what lines it is most likely to be productive. The adoption of an omniscient attitude on the part of the instructor would be highly detrimental to his chances of success, as he starts with nothing more than a sound knowledge of fundamental agricultural principles and has to acquire for himself the requisite local knowledge of the peculiarities of the crops, the water and the soils.

Personality therefore enters the scheme to a large degree, but there can be little doubt that a man possessing the power of obtaining the respect of the peasants and of inspiring their confidence can succeed in overcoming the inertia and conservatism inherent in them and acquire an ever widening influence for progress.

[At the experiment station for seed distribution mentioned above, the work of breeding out the best strains from the numerous native varieties of rice, also experiments on the cultivation of padis acquired from other countries are carried out on a considerable scale. In this way are obtained by selection varieties having different characteristics and suitable to different localities.

One for instance notable for its good milling qualities would be for a district where rice is grown for export. Another, resistent towards drought, would be suitable for land on which the continuance of an adequate water supply is uncertain, whilst others are characterised by their high yields, flavour, etc.

These, after having been bred out at the seed station are distributed to the various experiment stations, where their suitability to the local soil is tested and from which they are introduced into the district.]

IMPORTANCE OF EARLY TRAINING.

However it must always be from the training of the child that the main hopes of changing the customs of a people can be based, and it is intended, as previously indicated, to extend the scheme of agricultural education to the elementary schools also. Native teachers are being trained for the purpose by the instructors, and at an institution near Bandoeng, which unfortunately I had not time to visit.

At Tjinjiroean, in the school on the Government cinchona estate, this intention has, I was informed, already been carried into effect, and the children there learn as part of the curriculum to carry out the somewhat complex operations connected with cinchona and tea culture.

Those of us who, walking through a Malay kampong, have enquired the meaning of the tiny padi plots seen here and there and learnt that they were only *orang budak punya main main* can hardly doubt that similar lessons would not be distasteful to the young hopefuls of our own country.

Whether or not the principles embodied in this system may not eventually have to be adopted in European countries also may be a subject for debate, but for their tropical possessions, whose progress rests on the possession of a large and prosperous agricultural population, it seems difficult to conceive of an educational policy more likely to achieve the object of best fitting the child for the career which it is desirable—in the case of the vast majority—he should eventually follow.

Habits of industry would be inculcated, the inborn preference of the native for an out-door life fostered, and the sharpness of the transition from the school to the sawah softened almost to imperceptibility.

A boy thus trained should be less likely than he is at present to be influenced by the drowsy atmosphere of the school-house into choosing for his career the by no means strenuous one of the krani.

Finally, of not less importance would be the improvement in methods—and profits—that could not fail to result, and the lessening of the economic pressure tending to drive the present day cultivator to employment less fruitful though may be more remunerative.—Agric. Bulletin of the F.M.S.

FARM SCHOOLS IN FRANCE, GERMANY AND BELGIUM.

In view of the attention which is now being given to the subject of Farm Schools and Institutes, an educational pamphlet recently issued by the Board of Education is of interest, says the *Journal of the Board of Agriculture.* The author, Mr. R. B. Greig, has had exceptional opportunities of becoming acquainted with the systems of agricultural education adopted on the Continent and in the Colonies; his observations and conclusions are, consequently, entitled to careful consideration.

A large number of schools and colleges were visited by Mr. Greig; they can be classified as follows :—

(a) Farm schools situated on farms.

(b) Winter and short course schools with no farm.

(c) Long course schools with no farm.

(d) Secondary schools with an agricultural side and a farm.

(e) Schools of practical agriculture with farms.

(f) Agricultural colleges.

(g) Itinerant instruction and women's institutes.

The first class—farm schools situated on farms—are found in France, Germany and Belgium.

The author is of opinion that institutions of the type of the French Fermes-Ecoles have no conceivable place in English education, in view of the fact that elementary practical instruction is readily obtained on an ordinary farm; in some parts of Ireland, he thinks, schools of this type might be successful.

The German type of farm school suffers from the grave defect that, in practice, it has not succeeded in attracting the peasant farmer class; it is resorted to by youths who wish to qualify as managers or officials.

In Belgium, however, Mr. Greig found a school of the first type (Ecole Ménagrée) for girls doing useful work. It was one of a number organised for the purpose of instructing women in household management and domestic economy, which have been in successful operation for twenty years. The specific subjects taught are laundry work, dairying and poultry keeping, and almost every duty which falls to the lot of a farmer's wife is the subject of instruction and explanation, from the point of view of interest as well as economy.

(b) Short course schools with no farm.

An admirable type of this class of school was found in Sweden, near Svalöf. The programme of this school includes a winter session for men and a summer session for women. The school adjoins the well-known Swedish Seed Station, and is in the midst of a district where farming is of a very high class.

(c) Long course schools with no farm.

As a type of this class of school, the author describes a visit to a German Landwirtschaftsschule at Hildesheim. From this school over 90 per cent of the students return to practical farming. The technicalities of farming are not taught, only underlying scientific principles are dealt with, and about one half of the time is given to ordinary school subjects.

(d) Secondary school with an agricultural side and a farm.

Under this head Mr. Greig describes the Agricultural High School at Ballarat, Australia. The syllabus here also includes ordinary school subjects and only one-third of the pupils' time is given to agriculture. Manual instruction on the farm and in the workshops is a prominent feature. The opinion in Australia appears to be that a strictly "vocational" curriculum is a mistake.

(e) Schools of practical agriculture with farms.

This class includes the French Ecoles Partiques d'Agriculture, and they do not seem to have been successful in attracting the farming class of student.

The general conclusions of the author may be summarised as follows:—

1. No foreign or Colonial system is suitable for adoption *en bloc* in this country.

Mr. Greig points out that, since the general farm practice so far as manual processes are concerned in England and Scotland is superior to that of any country, education here should be directed to instruction in the methods and systems of farming, and to such subjects as improvement of land, crops and stock. A school in which a large portion of the time is devoted to instruction in such matters as ploughing, stacking or hedging, is not needed here.

2. Secondary and other schools with an agricultural bias will succeed best where the larger proportion of the pupils intend to follow agriculture; provided that masters with proper qualifications can be obtained, and that no attempt is made to teach the *art* of agriculture.

3. As an ideal organisation Mr. Greig suggests that the best results would be obtained from an institution which combined the following features: (1) A winter school for men; (2) a summer school for women; 3 headquarters of an itinerant staff of instructors; (4) a demonstration centre; and linked thereto (5) a secondary school with an agricultural side.

The author advocates the inclusion—on the French model—of moral and civic teaching in the curriculum of agricultural education, and lays great stress on the need for teaching business methods through instruction in book-keeping.

4. Finally, attention is invited to the advantages of itinerant work, when put into the hands of a really capable instructor.

A BRITISH UNIVERSITY OF TROPICAL AGRICULTURE.

Agricultural education has progressed recently by leaps and bounds, its larger growth beginning with James Wilson, United States Secretary of Agriculture for now some sixteen years. We must give due credit to the Germans for their scientific study of agriculture in the 18th century and give special credit to Messrs. Laws and Gilbert, who for more than fifty years at their own private Rothamsted Experiment Station in England, carried on a series of experiments and of scientific agricultural research work that was with any parallel in those days, and which became the inspiration of further research work on this side of the Atlantic, until to-day scientific agriculture has become the rule rather than the exception. All of this tremendous agricultural progress has occurred within the limits of the life of the writer. Sixty-five years ago he was the possessor of a book called "The Farm Book and his farmer friends in those boyhood days used to laugh at the idea of looking into the lids of a book for items concerning farming when the art of farming could only be learned by actual practice in the field, by following the oxen or the horses in the field, and there, in personal intercourse with Nature as it is or as it was, to learn all of its mysteries.

In the United States the granting of certain lands to agricultural colleges became the start of many so-called colleges. These colleges, however, had to employ teachers and these teachers, as a rule, knew nothing of agriculture. They did however, know the ordinary school studies and more or less of

Latin and generally something of Greek, as the teachers of these little collegiate schools were men of comparatively good education. It was a hard struggle with these little colleges to get them to adopt any agricultural curriculum and it is only within the last thirty years that agriculture has finally come into its own, the success of the various experiment stations founded by that apostle of agriculture W. S. Hatch of Missouri having given agriculture an impetus that has lasted until these days and is increasing in its momentum.

We are led to these reflections by the fact that Great Britain, with its immense area of tropical lands, including the British East Indies and the British West Indies, its African and Indian Ocean and Straits Settlement lands, the islands of Ceylon and its control in various other tropical lands, all of a sudden, is now arousing itself to an appreciation of the fact that tropical agriculture stands in about the same relation to the tillers of the soil in these lands that it did three or four thousand years ago. The wonderful success of the British West Indies during recent years and especially in banana culture by American interests and the distribution of these bananas in the United States way up into central Canada has taught the British at home the value of at least one new branch of agriculture and of commercial distribution. It has awakened them to the possibilities of the increasing magnitude in that industry many times and by a parity of reasoning is leading them to reflect on the possibilities of their East Indian possession along some similar lines.

We might state here how easy it would be to improve the agriculture in the East Indies when we say that about 35 years ago Ceylon produced over a million bags of coffee. The coffee trees were attacked by some insect and the coffee industry in a few years was practically destroyed. This led to the development of the tea industry in Ceylon and now Ceylon teas are actually driving China teas out of England, The United States being the chief consumer of China teas. The quick rally of Ceylon from one great industry to another shows the wisdom of these ancient peoples, but they seem to have lacked initiative, or to have been content to carry on their work in the old ways for scores of centuries, apparently without hope of any material improvement.

Manihot Plantation Rubber.

We take the following from the yearly report of a leading London Broker firm:

> Manihot Crêpe is now a most important grade and the outputs of the various estates are rapidly increasing.—The quality too, shows great improvement and consequently the prices paid throughout the year are, we consider, most satisfactory.—This rubber has proved very useful for a great many purposes, being extremely tough.

This report is very encouraging and we beg to add to it, that Manihot Plantations can be arranged from normal tropical conditions to excessive dry climates in elevations ranging up to 6000 feet. Manihot Glaziovii does well in regions with more or less normal rainfall; whereas Manihot Dichotoma and Manihot Pianiensis prefer heat and drought and will grow under conditions unfit to bear any other, being, about five times as many trees to the acre, than Hevea thereby reducing the cost of investment and of labour (planting, weeding, tapping etc. considerably:—

Yours Truly,

GEVEKOHT & WEDEKIND.

TIMBER.

THE RELATIVE STRENGTH OF NATURAL AND PLANTATION-GROWN TEAK.

The object with which these experiments were carried out was to ascertain whether the *plantation-grown* teak was as strong as that from *natural forests.* The answer is without doubt in the affirmative.

Another point of interest is that from the figures for Compression and Shearing tests it appears that the percentage of moisture in the timber has no marked effect on the strength of teak, whereas it appears to have a considerable effect when Transverse strain is applied to the timber, across the fibre.

It was thought that possibly the strength of girdled teak might differ from that of teak felled green and afterward seasoned in the log. In the tests carried out by the writer in 1910 the *plantation-grown* teak was felled green while the *natural-grown* teak was felled after having been girdled for three years. Again of the ten plantation logs cut in compartment 4 of the Kadin Bilin Reserve, in the Tharrawaddy Division, five were girdled and felled three years later, while five girdled trees were cut by mistake in the following year. It is of interest to compare the results obtained by testing these two varieties of timber for Transverse strength.

	Variety of, and locality from which the timber was obtained.	Average Transverse strain across the fibre, in tons per sq. inch.
Felled in adjoining forests.	Plantation-grown teak felled green and afterwards seasoned, from the Zigon Division.	7·32
	Natural-grown teak girdled and felled three years later, from the Zigon Division.	7·77
Felled in the same forest.	Plantation grown teak felled green and afterwards seasoned, from the Tharrawaddy Division.	5·17
	Plantation-grown teak girdled and felled three years afterwards, from the Tharrawaddy Division. ...	5·21

From the above two sets of figures it is perfectly clear that there is practically no difference in the strength of timber seasoned standing and when felled and seasoned in the log.

It is necessary to make one further point clear with regard to the tests, the results of which are recorded above, and that is that the greatest care was taken by the forest officers who supplied the timber to do so from the trees of equal age. An objection was made to the former set of experiments published in *Forest Bulletin* No. 3 of 1911 in this respect; however, by comparisons of the past and present results it will be seen that the criticism was premature, as the results are practically identical in every case, the variations in strength being negligible.—R. S. PEARSON in the *Forest Bulletin*.

PREVENTING TIMBER FROM SPLITTING WHILE SEASONING.

Mr. R. S. Pearson, F. L. S., in concluding his note on Ligno Protector as a possible means of preventing timber from splitting while seasoning observes that the conclusions arrived at from experiments are that (i) the seasoning process is without doubt very considerably retarded, a most desirable circumstance, (ii) the *Ligno Protector* by no means absolutely prevents timber from splitting, and though effective in some cases, it is absolutely incapable of protecting such species as *Quercus incana* from doing so, (iii) that before any definite opinion can be formed as to its commercial value it will be necessary to give it a trial on a large scale and under natural conditions.

It is hoped that some Forest Officer in charge of a timber depot will undertake such an experiment, especially with some of the more important species which are liable to split such as *Pinus longifolia*, or *Pinus excelsa*, *Xylia dolabriformis*, *Lagerstrœmia microcarpa*, *Dalbergia latifolia and Terminalia tomentosa*.

SHRINKAGE OF TIMBER.

(*Cedrela Toona*)

It may be taken as an established fact that Toon timber while seasoning contracts very considerably and that when seasoned it is very liable to absorb moisture and again expand. How long this process of expansion and contraction continues is not known. From general observations it is thought to continue for several years though probably in each succeeding year the variations are less marked. A specimen plank decreased nearly ·3 of an inch per foot in breadth from November 1910 to January 1912, in other words in little over a year and further contraction of about ·1 of an inch took place in the hot weather. At that period it was probably somewhere near the limit of its contraction for the moisture in the timber was then only 7·59 per cent. in other words it was completely seasoned. The very fact that only 7·59 per cent. of moisture was found in the timber shows the facility with which Toon wood loses moisture and it also probably indicates the facility with which it is again absorbed,

It is thought that the above test clearly shows the great necessity of seasoning *Cedrela Toona* as much as it is possible to do so and the danger of this excellent furniture timber falling into disrepute simply for want of a little care in seasoning it before conversion. If converted when in a green state the plank should be allowed to season for at least one year and if seasoned in the log for 18 months to two years.—R. S. Pearson in *Forest Bulletin No.15.*

THE PRACTICAL USE OF TIMBERS.

By CHAS. J. WOOLLETT,

Stock Inspector, Cobar.

Although the following notes refer more particularly to western timbers, the principles enunciated apply nevertheless equally to the use of timbers from other districts. Before entering upon the subject proper we will give an elementary description of the structure of timber.

All trees that provide us with timber are outward growing trees—that is to say, they increase in girth by developing successive layers round the trunk next to the bark. Each year generally adds one of the layers or rings, and consequently they are called "annual rings." In addition to the annual rings, trees have medullary rays, which are thin aad generally broken lines, radiating from the centre, or pith, to the bark, and *vice versa*. These rays are not very apparent in some trees, but in dry cypress pine they are easily seen. Cabinet makers call these rays the "silver grain."

The trunks and branches of trees consist of two kinds of wood—the hard, dead heartwood, or duramen, and the soft sapwood, or alburnum. The latter is much lighter in colour than the former.

The bark consists of an outer and inner layer.

It is through the sapwood that the root-sap is carried up to the leaves. Here chemical changes take place with the carbon that has been abstracted from the carbon dioxide of the air, which has found its way into the leaves by means of the breathing pores or stomata. After the various changes have taken place the "food sap" returns by means of the inner bark and passes through the medullary rays to nourish the tree.

Heartwood is much stronger and more durable than sapwood, and the outer portion of the heartwood is stronger than that near the centre, or pith, more particularly if the wood is "pipey," because then it has been subjected to decay and is very brittle.

Old wood is stronger, though lighter, than young wood. The strength of timber is influenced by the quality of soil on which it grows. Evenness of grain in the annual rings denotes strong wood. Localities subject to droughts produce faulty timber.

By strength of wood we mean the resistance it offers to force acting at right angles to its grain. This is called "transverse strength."

It must be patent to all that where the strongest parts of timber are preserved the structure built would have a much longer life than where the weaker tissues are made to stand the strain.

For stockyards, stables, huts, and the like, cypress pine (*Callitris sp.*) timber is generally used in this district, because it is practically the only timber of any size, and is much easier split and worked than the eucalypts and acacia.

Cypress pine is very fissile, but will stand very little transverse strain; and therefore, when using it, knowing of its weakness, workers should aim at conserving the strength in every possible way. Anyone familiar with pine used in stockyards knows that the rails most frequently break at or near the middle and at the tenon, which fits the mortise of the post. When pine saplings are used as rails the posts should be close together to lessen the strain when stock bump against the rails. Little or nothing but the bark should be removed from young pine in making a tenon, because the young wood is much weaker than that from mature trees, and by removing the harder heartwood of an already weak timber the strength and durability is very materially lessened.—*Agricultural Gazette of N. S. W.*

COTTON.

COTTON GROWING IN THE ANGLO-EGYPTIAN SUDAN.

The British Cotton Growing Association have issued an interesting report on the possibilities of the Sudan as a cotton producing country. The object of the association, as is well known, is to encourage and assist cotton growing in British territory for British looms. The association have selected a very fine tract of land 5,000,000 acres in extent, in the Gezira stretching between the Blue and White Niles, south of Khartoum. Here is land already levelled by nature and of the rich alluvial soil so suitable for cotton. It is absolutely virgin, never having, through lack of water, borne herbage, rain rarely falling in that district.

A small experiment station was started with irrigation pumps and the cotton produced amply fulfilled the hopes of the association.

Transport facilities are good, by river and by rail to Port Sudan. Labour is cheap, though not too plentiful, but the new generation, children of the Government as they are called, born since peace was established, will soon fill the ranks of men depleted by the Dervish wars. Here then is everything that is desired save water to turn valueless, sterile land into one of the richest crop-bearing lands in the world, bringing prosperity to a country which by no means abounds in natural resources of wealth.

The whole question only remains to be settled by the facts and figures of the Irrigation Department. The association does not seem to lay sufficient stress on in their otherwise glowing accounts upon the following questions. Egypt is more or less an international country and for any other country, although nominally the Sudan also belongs to Egypt, to build barrages above her on the Nile would be a constant menace to her, for that country could at any moment practically cut off her water supply, thereby benefitting itself.

Secondly there are years when the flood is so scanty that Egypt requires every gallon of water the Nile can yield.

Then will arise the difficulty as to which country is to suffer, though possession is always nine points of the law.

Thirdly, if under any circumstances Egypt can only spare the water during flood time on the Blue Nile, which the report states to be between July 15th-March 1st, but which we understand is a very much shorter period in reality, will this period be long enough to ensure the ripening of the cotton, especially in years when the flood begins late or stops short at the end?

Fourthly, Egypt herself has much land still capable of bringing under cultivation and for which, until the recent raising of the Assouam dam, she had not sufficient water, and for this her demand will be still greater in times of low flood.

It looks then as if great care will have to be exercised by the Department of Irrigation (if this otherwise excellent scheme of the Association is put through), that the interests of Egypt are strictly protected.

The report goes on to point out that some sort of Land Bank under Government supervision would have to be inaugurated to finance the cultivators and to save them from the clutches of the foreign money-lenders.

It also remarks on the difficulties in the way of administering this new land, which is mostly owned by natives, and which from being only worth 2/- per acre now would, with irrigation, quickly become worth £20 per acre.

So that some system of rearranging the land must be thought out whereby the increase of land value would pay for the cost of the irrigation works.

But there are other districts in the Sudan, notably Tokar, Cassala and on the higher reaches of the Blue Nile where cotton growing on the flood waters of rivers other than the Nile and supplemented by rain, can be developed most advantageously, thus avoiding tapping the Nile or interfering with Egypt in any way.

If these foregoing objections to the Gezira portion can be arranged satisfactorily the Association will certainly have done a great work in bringing to the notice of the British Government so excellent a scheme for adding vitality to the Sudan and for benefitting the large native population of that country.

D. S. C.

COTTON GROWING IN LOUISIANA.

Cotton growing began in Louisiana, states the *Bulletin of Agricultural Intelligence*, towards the end of the seventeenth century ; Siamese white lint cotton was introduced in 1758.

CLIMATIC CONDITIONS.

Louisiana is now one of the principal cotton growing countries of the world, and this chiefly owing to its climate : relatively high temperature (from April to November : the lowest mean monthly temperature in from April to November ; the lowest mean monthly temperature in November in Northern Louisiana being 7·7° C., the highest also in Northern Louisiana, in July 34·3° C); long period of vegetation ; a good deal of sunlight (from June to September : completely cloudy days 19·4 in North Louisiana and 21 in S. Louisiana); regular and well distributed rains during the growing period (on the average $4\frac{3}{4}$ inches per month from June to September) and dry weather during the ripening period.

SOIL.

Cotton can be raised on all kinds of soils, though with varying success. On sandy soils the plants develop less ; on heavy soils they attain, especially in wet years, considerable height, but in proportion to their size do not yield much lint. The same in low lying lands : in favourable years the crops are good but in others they are much damaged by animal and vegetable pests. The most favourable of all are medium loams. However, with the aid of manuring and suitable tillage even the less favourable soils can be made to yield satisfactory crops.

CULTIVATION.

As there is still a good deal of uncultivated land, cotton growing might have considerably extended if it had not been checked by the appearance of the boll weevil (*Anthonomus grandis* Boh.), which has not only set a limit to further extension but has obliged many planters to give up cotton altogether.

ROTATIONS.

Those most commonly adopted are the following:—

(a) 1st year cotton, 2nd year maize, then cow peas.

(b) 1st and 2nd years cotton, 3rd year maize and 4th year cow peas.

(c) 1st year cotton, 2nd maize and cowpeas, 3rd winter oats (sown at the end of October or beginning of November) then cowpeas (sown on the stubble in May).

(d) As the preceding, but with cotton for two years or in the 3rd year sowing in the oats Japanese clover (*Lespedeza striata*) which occupies the 4th year also. On loams sometimes *Vicia villosa* or clover is sown in the oats; on sandy soils crimson clover is sown in the oats and Velvet beans in the maize or, these by themselves, or peanuts, especially the Spanish variety.

PREPARATION OF THE SOIL.

This is not always carried out with due care. Sometimes it consists in merely ploughing up the ridges of the previous year before sowing. The best results are obtained by those farmers who begin their ploughing towards the end of autumn or beginning of winter. Among other advantages there is that of destroying many pupæ or boll worms (*Heliothis armiger*). In the large estates the subsoil plough is also used; by this means alone the crop of seed cotton increases by about 150 lb. per acre. After ploughing, which is done crosswise to the direction in which the cotton will be planted, the ground is repeatedly harrowed, and rolled until a garden-like tilth is attained. In low lying ground the rows are ploughed, so that the soil may dry better if the weather is unfavourable. On high land this is done only just before sowing or is omitted altogether.

MANURING.

It is often defective. Experiments carried out for many years in succession at the Baton Rouge and Calhoun Experiment Stations have proved the necessity of completing organic manures by chemicals. The best results were obtained with 30 bushels per acre of a compost consisting of 100 bushels of cotton seed, 100 bushels of farmyard manure, and 2,000 lbs. of phosphate. At Calhoun, land manured with this compost yielded an average of 1,513 lbs. of seed cotton per acre, and at Baton Rouge 1,246·6 lbs., whilst the unmanured plots yielded only 466 lbs. and 1,034·3 lbs. respectively. The quantity of artificials given to cotton in Louisiana is trifling.

VARIETIES.

Early varieties are grown, especially short stapled, small boll, Upland varieties. Long stapled early varieties Sea Island) have been bred and the United States Department of Agriculture is endeavouring to introduce them, but their cultivation and harvesting are more difficult, and for ginning

them special gins are required ; further they do not sell well on the local markets and they require continuous selection ; for these reasons few planters care to grow them. The most widely spread varieties are the following :—

(1) Tooles Early Prolific. Short staple and small bolls. About 87 bolls give 1 lb. of seed cotton. It is a low early bush, and it produces much seed cotton and lint.

(2) Kings Early Improved. Short stapled, abundant, seeds small, long branches.

(3) Simpkin's Early Prolific. Short stapled, somewhat earlier and more productive than the preceding long branches, short internodes, seeds small.

(4) Mebane's Early Triumph. Short stapled, large bolls. Seeds medium sized. 46 bolls yield 1 lb. of seed cotton.

Many farmers in the north of the cotton belt use imported seed. This ripens earlier than the native seed but every two years new seed has to be imported.

In most cases the seed is taken from the ginning works. Many farmers get their seed from merchants or direct from the growers, especially in Georgia, Carolina and Alabama. Only a few of the largest farmers produce their own good seed by means of selection,

INTERCULTURE.

The seeds are sown in rows as early as possible when no more frosts are to be expected (March-April). The quantity of seed is 1 bushel (30 lbs.) per acre, though as experiments conducted in Texas by the Bureau of Plant Industry have shown, 4 to 7½ lbs. of seed per acre are sufficient under favourable conditions to give a good stand.

The distance between the rows ranges from 3 to 5 feet and between the plants from 10 to 30 inches according to the soil and the variety of cotton grown. According to the writer the advice to plant at a great distance apart is not sound beyond a certain limit, because formerly the cotton plants continued producing buds till September and even October, whilst now the plants produce only up to the middle of August, because after this date the boll weevil prevents any further bud formation. Experiments carried out by the State Crop Pest Commission in the years 1907 and 1908 showed that close planting gave the best results, increasing the crop by 30 to 60 per cent. The most favourable distances were found to be:—

	Between the rows.	Between the plants.
1. On poor high land	3 feet ...	10 inches
2. On rich high land and good prairie soil	3 ,, ...	12 ,,
3. On poor or very sandy plain land	3½ ,, ...	12 ,,
4. On well drained plains of medium fertility	4 ,, ...	15 ,,

These experiments showed also that in close planting the ants (*Solenopsis geminata*) played more havoc among the boll-weevil brood than heat or parasites.

A few days after sowing, the tilling of the soil begins again in order to keep the surface loosened. At first the harrow is used and then the cultivator. Singling is performed twice, once when the plants are about one inch high and the second time when they are 12 inches high ; after this they are slightly earthed up and, weather permitting, the ground is worked once a week with the cultivator. At the end of July or beginning of August the soil is smoothed and thoroughly harrowed.

Topping has been given up.

HARVEST.

The harvest begins usually at the end of August and lasts to the middle of December. The quantity picked by one labourer in a day varies considerably. Some barely reach 100 lbs., others pick 300 to 350 lbs., first class pickers attaining 500 and 600 lbs. The cost of picking is about 75 cents (3s. 1d.) per 100 lbs.

The cotton is not dried before being ginned. Ginning is done in special mills which deal with at least 50 to 75 bales a day and in some instances as many as 250 per day. The cost of ginning a bale is $250 (10s. 3d). As payment seeds are accepted. In 1906 there were upwards of 1,500 ginning mills against 1,200 in 1911. The seeds that are not used for sowing are sent to the oil mills, of which there are about 50 in the State.

YIELD.

The average yield has increased somewhat of late years, but it is only about 170 lbs. of lint per acre (in 1911 it reached only 143 lbs. per acre). With intensive farming and energetic control of the boll weevil it is possible to attain much higher yields, as is proved by statistics which show that as much as 356 lbs. per acre have been obtained.

CONTROL OF PARASITES.

The boll weevil appeared for the first time in 1830 at Monclova in Mexico, where in 5 years it played such havoc that cotton growing had to be given up; in 1850 it reached Matamoras and 10 years later the Rio Grande. In 1862 it appeared at Brownsville, Texas, and in 1903 in Louisiana. By the end of 1908 it infested the whole cotton territory of the State. The harm it has done may be seen from the following figures:—

Year	Under Cotton acres.	Lint 500 lbs.bales.
1902 ...	... 1,617,586	882,073
1909 ...	... 930,000	253,412
1911 ...	... 1,075,000	365,500

For the direct control of the boll weevil, arsenate of lead sprays have been suggested, but owing to the difficulties attendant upon its use this remedy has not become popular. On the other hand the practice of collecting the

infected bolls from the beginning of May to the end of July has become general. The bolls are placed in boxes covered with wire netting, the meshes of which are wide enough to allow the parasites of the weevils to escape but not the weevils. It would be of very great advantage to destroy the cotton plants early in autumn, but few growers make up their minds to do so. The utility of this measure, besides being proved by the experiments of the State Crop Pest Commission, has been shown by the immunity from the pest enjoyed by the plantations grown in localities in which the cotton plants had been destroyed by frosts in the preceding year, as was the case in the northern parishes of Louisiana after the frost of 1907.

For destroying the plants at the end of the season some machines have been invented, one of the simplest of which consists of a cylinder of 18 inches diameter and 6 feet in length bearing sharp iron bars 3 inches broad and $1\frac{1}{2}$ inch thick. With this machine 10 to 12 acres a day can be cut.

Before the appearance of the boll weevil those varieties the bolls of which ripened before the danger of frost was to be apprehended were considered early. Now early varieties are those that show first the setting of fruit buds. The signs of precocity are: low branches (the main branches that do not bear fruit must not be more than four); short internodes; fruit branches at every internode of the main stem or of the main branches; continuous growth of the fruit branches, as the boll weevil attacks first the upper twigs and does not damage the bolls so long as there are available buds; the average breadth of the leaves for the plants of the high lying lands must not be more than 6 inches and for the plains not more than 4 or 5 inches.

In selecting, the following points are also to be observed:

(1) Size of the bolls (the larger bolls being easier to pick and offering greater resistance to bad weather)

(2) High percentage of lint (38 to 40 per cent.)

(3) Length of staple not under one inch.

Resistance to bad weather.

BLACK COTTON SOILS.

Mr. W. H. Harrison, Government Agriculturist, Madras, and Mr. R. Ramaswami Sivan his assistant have published a paper in the memoirs of the Department of Agriculture in India, Chemical series, on "A contribution to the knowledge of black cotton soils in Southern India." Based on a study of these soils *in situ* with reference to the underlying geological formations and on experiments conducted with these soils in the laboratory, they arrive at the following conclusions in regard to their *origin and nature*:—

I. The black cotton soils of India are not derived from any specific geological formation, such as trap, but are formed from many diverse formations and, generally—when not alluvial—bear a close relationship to the underlying rocks.

2. Titaniferous magnetite is not a constant factor in the regur soils of the Madras Presidency, and even when found, the amount is small, but its presence in quantity is characteristic of the soils of the trap area. It cannot, therefore, be looked upon as the cause of either the colour or the physical properties of these soils, but only as a modifying agent.

3. The colour and peculiar physical properties of black cotton soils are associated with the compound particles of low specific gravity, which are found in all these soils.

4. Two classes of substances have been recognised as conferring the colour and physical properties. One is probably a colloidal hydrated double iron and aluminium silicate, which is mainly concerned with the formation of compound particles and which possesses, in a modified form, the properties of ordinary clay. The other is organic in character and may probably be an organic compound of iron and aluminium.

COTTON APHIS.

The cotton Aphis is a small dark green insect about one twentieth of an inch long with two small tubes or siphons protruding from the posterior end and is to be found in clusters or colonies under the leaves and on the stem of the cotton plant.

The colony is started by a winged female who produces living young parthenogenetically, that is without previously being fertilised by a male. At the beginning of the season the young are all females and wingless, and may be seen together with the larger forms clustering under a leaf. They are of a pale yellow colour. These after a few moults, attain their adult form and start producing living, wingless young parthenogenetically. Later on in the season, winged forms appear which fly off starting fresh colonies elsewhere.

Aphids secrete a sticky substance which is much appreciated by black-ants which will always be seen running over the leaves inhabited by Aphis colonies.

NATURAL CONTROL.

Aphids are to a certain extent kept in check by lady-bird beetles *(Coccinelidæ)* which feed on them in both the larval and adult stages.

These are small beetles about the size and shape of half a pea; and coloured in red, yellow or black markings and spots. The larva is a small black grub with six-legs which runs about the leaves feeding on the Aphids.

ARTIFICIAL CONTROL.

The only way to stop an attack of Aphis is by spraying with a contact poison. This must be done as soon as the first colonies appear. A constant watch should be kept on the cotton for the first sign of Aphid attack when measures to check it should be promptly taken. Should the spraying be delayed until later in the season when the winged forms are produced, it will be impossible to do anything except at enormous cost.

There are two sprays which are the best for this country, viz., Kerosene emulsion and Tobacco infusion. The former has the draw-back of expense, but the latter, although cheap, is not nearly so strong an insecticide as Kerosene emulsion. It has however been tried with success at the Bwaila Experimental Gardens. Kerosene emulsion is made in the following manner:--

Boil half a pound of sliced bar soap in 1 gallon of water until dissolved. Take off the fire and add two gallons of kerosene stirring and beating the mixture until the kerosene is emulsified. This is the stock solution and should be diluted with six to ten parts of water before being used.

Tobacco infusion, which perhaps is the hardiest for this country, is prepared by soaking two pounds of tobacco refuse (stalks and leaves) in 2 gallons of water for 24 hours, or boiling for half an hour. Then dissolve ½ lb of bar soap or 1 lb of soft soap in the mixture. This is the stock solution and should be applied diluted with seven parts of cold water.

Both the above poisons are contact poisons and must actually hit the insect before it can be destroyed. Merely spraying a leaf with either of them will not kill any Aphids which may come along afterwards. Aphids are sucking insects, and stomach poisons such as Paris Green will have no effect on them.

The best apparatus for spraying is the "Four Oaks" Knapsac spraying machine. This has all the working parts outside and is made of copper so that it is not damaged by insecticides. It holds about 3½ gallons of liquid and two men with one machine should be able to spray four acres a day where only plants here and there have to be sprayed as in an attack of Aphis. When spraying for Aphis it should always be borne in mind that the colonies are on the *under* side of the leaves and stalks, not on the upper side.—*Supplement to the Nyasaland Government Gazette of 31st January, 1913.*

COTTON IN EGYPT.

By D. S. CORLETT.

Superintendent of Peradeniya Experiment Station.

Egypt has always been a wealthy country ; in the old Roman days wheat and barley were the source of its great wealth and it became the granary of the world. But now-a-days cotton is its chief staple. Cotton planters in countries other than Egypt, seeing the large yields and the high price obtained for Egyptian cotton, not unnaturally think that this is the cotton they should try to grow.

But there are several factors that are not generally considered.

The first is, that Egyptian cotton may almost be considered an exotic, seeing that Egypt is quite an exceptional country for growing it to perfection, for it is a land where neither drought nor flood nor frost occurs. Secondly, the soil is one of the richest alluvial deposits in the world, rich brown mud brought down from the Abyssinian mountains by the Nile and with which the land is replenished every year. Thirdly, by the wonderful scheme of irrigation the amount of water required by the cotton plants can be gauged to a nicety and it is of primary importance that the young plants

should not have too much at first, and that there should be plenty during the bolling season, though even then it must be carefully regulated or over-watering will lead to shedding of the bolls. Fourthly, Egypt has practically no rainfall in the cotton-growing regions and rain, falling when the cotton is ready to pluck, is very detrimental, dashing it to the ground and rotting it. And lastly, the demand for Egyptian cotton is a limited one, as it is too fine for some commercial purposes. Whenever it is used alone it is in the manufacture of the very finest cotton articles, but it is generally used mixed with American. The limited demand is especially noticeable in the new kinds such as Sekellaridis or Nubari. For instance two years ago the former, a beautiful, white, silky cotton with a very long staple, was largely in demand and obtained a very high price and in conseque ce last year it was largely planted, with the result that the supply exceeded the demand and the price went down, whereas the price of Nubari rose, owing to the fact that there was a sudden demand, owing to one firm's enormous order for the canvas lining or motor tyres and for which this cotton is of particular value. Therefore it can be seen that Egypt herself can over-supply the demand in these special varieties and any planter wishing to grow Egyptian cotton should avoid these and keep to the original and good-all round Mit Afifi.

But although the price obtained for Egyptian cotton is so high, Re. 1 (1s. 4d.) per lb. being paid for first class Mit Afifi on the spot and for the other varieties 1s/5 and 1s/6 per lb. as against 6d.-7d. for American, it is not the fellah or cultivator who profits, for the purchase price and rentals of land is very high. For first class land 2,000 rupees per acre is a moderate price and as much as 225 rupees the rental for one year. The fellah who rents the land generally calculates to pay his rent and labour out of his cotton or his maize crop, for he should obtain an average of four kantars of cotton, worth 240 rupees. After the cotton he will either sow a crop of clover, barley or wheat, and this will represent his net profit, which will not be a very great one.

The land is nearly all owned by small native land-owners, about seventy-five per cent. owning less than five acres. Of the remaining proprietors some own many thousands of acres and these are naturally very wealthy. Practically there are no private European planters, but there are a few big European land-companies engaged for the most part in reclaiming either the salt, waste-land along the sea coast of the delta or where the sands of the desert have encroached on the good soil. Land reclaimed in this way takes from five to ten years before it becomes sufficiently good to bear a crop of cotton, which can then only be planted once in three years. On good lands cotton is generally alternated with either maize, wheat, barley or beans. The fellah does not generally manure his cotton save with a little manurial refuse from his village and cattle sheds, with the mud thrown up in cleaning the canals or by ploughing in his clover after the first or second cut.

But with careful cultivation, and provided his crop has been free of insect pests, he can count on obtaining 1,260 lbs. of seed-cotton per acre. But where artificial manures have been applied, as much as nearly double that has been obtained.

Selected seed of the various varieties is supplied by the Government to land owners, the price of which is recovered with the land-tax in the autumn after the crop. After the land has been thoroughly ploughed and ridged, the seed is planted in May by hand two-thirds up the ridge, 8 or 10 seeds to a hole, and the distance apart according to the soil, the average being $2\frac{1}{2}$ by $1\frac{1}{2}$ feet. About a month after sowing the young plants should be thinned out, eliminating all small and sickly ones and a species of poor cotton called "Hindi" or Indian cotton, which is invariably mixed in with the good, leaving only two strong plants in each hole.

The plants then receive their second watering, the first having taken place directly after sowing—thus a month elapses between the primary waterings. Thereafter the periods decrease in time, 25, 20, 18 and 12 days.

Great care should be exercised that no water be allowed to stagnate on the land, for this is fatal to cotton, good drainage being as essential as regular water, and this is one thing Egypt has to watch carefully—lest her soil becomes over-irrigated and the sub-soil water-logged. Big drainage pumps are now being erected, by which the surplus water is pumped into the sea, as Egypt is so little above sea-level that natural drainage often stagnates.

We now come to the great danger to Egypt's cotton. Firstly, there is the cotton-worm which makes its appearance in the early stages and devours all the young leaves. This caterpillar lives also on the clover during the winter and it is one of Egypt's problems to cut off this supply. But as the cl ver is absolutely essential to the fellah for feeding his cattle during the winter months, when no other green fodder is available, the problem is a difficult one. The Government takes the most energetic measures to cope with the pest and the moment it makes its appearance in any alarming quantities, police are drafted into the district and all headmen of villages are compelled to do their utmost in supplying labour to pick off and burn the insects or the eggs deposited on the leaves. Where the local labour is insufficient, gangs of labourers from Upper Egypt are brought down under Government supervision to add to the organised attack on the pest.

The next most serious pest is the boll-worm and this is more difficult to deal with, inasmuch as it is not so conspicuous an insect, burrowing into the newly formed boll and ruining one or two, if not the whole, of the 4 or 5 sections.

There are several minor pests such as aphis and cut-worm, but against all these pests the Government are taking the most energetic preventative measures for the fellah, if left to himself, will take no initiative steps to protect himself and, incidentally, the welfare of the whole country.

Egypt has lately awakened, though somewhat late in the day, to that most important factor provided by nature for reducing insect pests, namely insectivorous birds, the protection of which is a thing all tropical countries should look to before it is too late. It was an old saying amongst the fellaheen that whenever a flock of white egrets, or cranes as they are called in Ceylon, made their appearance following the plough, a good crop of cotton was assured, the reason being, as lately discovered, that these birds are particularly partial to the chrysallis of the cotton-worm, turned up out of the soil by the plough. It was then discovered that whereas a few years ago these birds abounded in thousands, they were now almost extinct, having been shot out. For, with the increased cheapness of guns and ammunition, these tame birds became the prey of every native, both for its flesh and its plumes, *which form an inferior egret.* And it is remarkable that it is only within the last few years that the cotton-worm has obtained its present dangerous magnitude. So the Egyptian Government at once issued stringent laws, published and placarded in every public place, protecting not only egrets, but every insectivorous bird such as larks, plover bee-eaters, wood-peckers etc., and established breeding depots for the egrets.

Having successfully weathered the attacks of pests, the flowers should be in full show in July and the first picking begins in September. The picking is done mostly by women and children who stuff the cotton into their shirts which are tied round the waist, till, becoming distended, they disgorge the cotton on the collecting ground. The great points to be observed in picking are as follows:—

To pick the lint clean and free from leaves, twigs and diseased, discoloured cotton.

To only pick cotton which is properly ripe and open.

To avoid picking the cotton in the early morning when it is damp with the dew, for damp cotton closely packed in sacks induces heat and mould, spoiling both the cotton and the seed.

And lastly to keep the three or four pickings separate, as the first picking is always the best cotton and commands a higher price.

Most of the cotton crop belonging to the big proprietors is bought as it stands by the big cotton firms, English, Grecian and German. But the small land-owners sell their cotton in the villages to native or Greek merchants, who in their turn transport it in big sacks containing 300 lbs. by camel, cart and canal-boat to the various ginneries owned by Greeks and natives which are scattered all about the country. But naturally the ignorant fellah is being cheated by the merchants both as regards weight and price, so the Government has lately instituted weighing depots in cotton-centres, where the fellah can have his cotton weighed by Government scales and where the price of cotton is daily written up. But like many new institutions, this has not been a great success for various reasons, but no doubt after the scheme has been amended, the fellah will recognise its undoubted benefits.

The ginning factories are generally worked day and night, women and children feeding the machines which comb out the seed and diseased cotton from the good lint. This is collected by a truck which passes down between the double row of ginners and empties the lint into a big room where it is tossed about by boys to cool, and is lightly sprayed with water. Then it is immediately carried to the hydraulic presses, pressed and banded into bales ready for the final shipment.

The diseased and bad cotton go through a special gin and is made into cotton-waste, whilst the seeds are collected either for seed-purposes or for extracting oil and making cake.

The Deputation of the World's Cotton Spinners, which lately visited Egypt were very impressed by the advanced methods of cultivation in vogue but pointed out that Egyptian cotton was undoubtedly deteriorating owing partly to soil exhaustion, for cotton is a very exhausting crop, and partly to the fact that not enough attention is paid to keeping up the standard of seed. To this the cultivators replied that if the buyers would pay a higher price, they, the cultivators, would expend more time and money in correcting these faults.

Thus it will be seen that Egypt's wonderful cotton is not without its dangers and its faults and that it is not a cotton that can be successfully cultivated in any country.

CONCLUSION.

In the foregoing it will be observed that the Egyptian Government has fully recognised the importance of helping the native cultivator for the general welfare of the country and in framing laws not only to protect him from the disastrous results of his own indolence and his fixed idea that what was good enough for his fore-father Adam is good enough for him, but in seeing that those laws are carried out to the letter, with the result that to-day the fellah has advanced with marvellous rapidity in rational cultivation of the land; he is happy, free and contented; and the wealth of the country has increased enormously.

D. S. CORLETT.

Peradeniya,
May, 9th, 1913.

GENERAL.

PROGRESS REPORT, LXII.

Membership.

The following have joined the Society since the last meeting of the Society on February 3rd, 1913 :—

Vicompte de Luppé, Norman F. Palmer, D. I. Mackenzie, P. M. Elias, M. L. Wilkins, E. J. Starey, A. Anderson, Superintendent of Telbedde Estate, Montague E. Cooke, P. Gunawardhana, C. C. Barry, E. R. F. Batty, Count de Manny-Talvande, Ralph Nicolle-Searancke, V. R. Stirling, M. J. C. Fernando, F. R. Francillon, Danton P. Ratnayake, H. A. Burton, Ouvah Ceylon Estates Ltd., Talpitigala Estate, Rockhill Estate, J. S. Wilkie, Colombo Apothecaries Co., Ltd., A. Alger, M. A. Corera, Don Simon Meegama, James E. Atapattu, J. Shaw Hellier, Robert Wilcox, S. Kanapathipillai, Superintendent of Clunes Estate, Manager, Molesworth Rubber Estates, C. C. Wilson, S. L. Naina Marikar, The Bombay Java Trading Co., Ltd., A. D. E. Elmer, C. J. Phillips, Secretary, Powysland B. E. A. Ltd., Superintendent, Viceregal Estates, Lie Tek Gwan, G. N. C. Ponnampalam, Dangan Plantations Co., Ltd., Casseemjee Adamjee, Harold North.

The total number of subscribers now amounts to 1540 consisting of 878 local and 662 foreign subscribers. A complete list of members, with their addresses, will be found in the Society's Year Book just issued.

Changes in Staff.

With the transfer of Mr. N. Wickremaratne as Secretary to the Board of Control for Co-operative Credit Societies, Mr. W. Molegode takes up the duties hitherto performed by him, and will be more in touch with the Secretary's office.

Mr. Molegode's place has been filled by the appointment of Mr. Jas. R. Nugawela who has been serving as an apprentice under training and acted also as Instructor. Mr. Nugawela's work will be in the Kandyan Provinces with which he is familiar, and his social status should greatly facilitate his work.

Mr. M. J. A. Karunanayake's services have been placed at the disposal of the Assistant Government Agent, Puttalam, who has submitted a special programme of work for that district, where village cultivation needs all the assistance it can get.

Movements of Staff.

The Director of Agriculture attended conferences at Ratnapura and Galle, and inspected the Experimental Gardens at Balangoda and Bandaragama, and the School Gardens at Kalupahana and Dippittigala. He also visited Chilaw in connection with the opening of coconut trial grounds and presided at a prize-giving for school-garden work at Nugawela school.

In February the Secretary proceeded to Jaffna and also visited Kangasanturai, Vavuniya, Madakanda and Iratperiyakulam. Later in the same month he was at Nugawela, Matale and Colombo. In March he accompanied the Director of Agriculture on a tour begun at Haputale and extended to Haldummulla, Balangoda, Ratnapura, Bandaragama, Galle, Matara, Tangalle, Ambalantota and Colombo. In April he undertook a tour through Matale North, Dambulla and Tamankaduwa districts.

Mr. N. Wickremaratne, Agricultural Instructor at headquarters, visited Kegalle in connection with the supervision of the Gardens of that district, Galle, in connection with Coconut Trial Grounds and Sugar Cane Experiments; Kurunegala, in connection with the introduction of Indian lac on Kon (*Schleichera trijuga*); and Hikkaduwa, in connection with Co-operative Credit work.

Mr. W. Molegode, Agricultural Instructor, Central Province, made a tour of inspection in Uva visiting Palugama, Bandarawela, Welimada, Haputale, Naula, Bogoda, Badulla, Passara, Soranatota, Palawatte; travelled in Harispattu and Yatinuwara; carried out inspections in Tumpane, Dunuwile, Madipola and Kalalgamuwa, in connection with paddy operations, and Matale and Naula in connection with cotton cultivation; he also paid special visits to Udispattu, Harasbedde, Manikdiwala, Nawalapitiya and Pundaloya. He was occupied for some time at Nugawela School Garden organising a new scheme of work initiated by the Director of Agriculture.

Mr. N. M Jayasuriya, Agricultural Instructor, Southern Province, was chiefly engaged in the cotton gardens at Ambalantota and Kahawatte; visited East Giriuwa and Magam Pattus and assisted the cultivators and attended meetings held at Tissa, Baddegama and Hikkaduwa for the formation of Credit Banks.

Mr. S. Chelliah, Agricultural Instructor, Northern Province, attended to the planting of Ceara rubber under Vavuniya tank, and of date palm suckers in Jaffna, Pt. Pedro and Mannar; supervised the work of the Jaffna Experimental Garden; treated coconut trees suffering from bleeding disease in Veddakadu, Velani, and Punkudutivu; conferred with the Maniagar of Puneryn, the Ratemahatmaya of Vavuniya, and Kachcheri Mudaliyar of Mullaitivu, about the formation of Agricultural banks; and inspected the School Gardens of the Province.

Mr. P. B. M. Bandaranayake, Agricultural Instructor, Uva Province, paid visits to Passara, Kumbalwela, Naula, Ella, Kahagolla, Mirahawatte, Dandagamuwa, Devitotawela, Deyakela and Ettipattiya assisting the paddy cultivators. He also visited Palawalla, Ekiriya and Mahakumbara in connection with the improvement of Chena Cultivation methods.

Mr. L. A. D. Silva, Agricultural Instructor, Sabaragamuwa Province, was mostly occupied in the Experimental Garden at Balangoda where he has done good work, principally in the introduction of exotic vegetables. He is pushing onion cultivation in the district and endeavouring to popularise South Indian seed in place of bulbs for propagation purposes.

Mr. A. Madanayake, Agricultural Instructor, North-Western Province, was occupied in supervising the rotation gardens at Hettipola and Balalla and the cotton plot at Diulagoda. He also visited the new School Gardens at Gokarella, Boyagama, Bogollagama. In connection with a special report on areas under cotton in the dry districts he was engaged in measuring plots at Pannala, Makandura, Wekada, Etiyawela, Kankaniyamulla, Kuliyapitiya, Dahanekgedara, Hettipola, Balalla, Polpitigama, Nikawewa, Konwewa, Diullewa, Wariyapola, Itanawatta, Awalegama, Weuda, Pilessa, Ibbagamuwa and Ehetuwewa.

Mr. M. J. A. Karunanayake, Agricultural Instructor, Chilaw-Puttalam, visited Pallam Pattu of Demalahat Pattu; Kumbukkadawara, Madurankuli, Kattakadu, and Karadipuval in Puttalam Pattu; Battuluoya, Karukkupone, Chilaw and Tambagalla in Pitigal Korale North; Medgama, Galmuruwa, Madampe, and Marawila in Pitigal Korale Central; Dummaladeniya and Haldanduwana in Pitigal Korale South. The object of these visits was (1) to encourage cultivation of vegetables and fruits and (2) to improve methods of paddy cultivation. He also visited Anamaduwa where it has been decided to start an experimental garden and visited Kalpitiya to inspect the date palm suckers planted last February, which are reported to be doing well.

Mr. C. K. Sathasivam, Agricultural Instructor, Eastern Province, has been working in the garden at Tampiluvil and pushing cotton cultivation in the Province.

Conferences.

A conference was held at Ratnapura Kachcheri on the 4th February at which the Government Agent presided. The Director of Agriculture and the Secretary of the Society and a number of local residents were present. The principal subject discussed was co-operative credit.

A similar conference was held at Galle Kachcheri on the 7th March when the chief topic was the opening of a coconut trial ground for the Galle district. Most of the large proprietors of coconut estates were present and their offers to place land at the disposal of the Agricultural Department is under consideration.

It is proposed to arrange for a conference of Agricultural Instructors about the middle of the year. The meeting will be held at Peradeniya and allow of the discussion of various practical measures.

"The Tropical Agriculturist."

This Magazine, which has been described as "the foremost unofficial Journal of Agriculture in the world," has been acquired by the Society who thus become its sole proprietors.

Founded in 1881 by Mr. John Ferguson, C. M. G., its interests have extended far beyond the limits of the Island and embrace the whole of the tropical world. To Mr. Ferguson will always redound the credit of having launched the magazine, and maintained its popularity for a quarter of a century; and it remains for the Society to preserve its best traditions while endeavouring, if possible, to improve upon its character and extend its popularity as the leading authority on all questions relating to cultivated products.

The printing and publishing have been entrusted to Messrs. H. W. Cave & Co.

The "Govikam Sangarawa."

At the end of last year the subscription of this monthly magazine—the only Sinhalese agricultural publication—was reduced to 50 cts. per annum. This fact was duly advertised and special copies were issued as a supplement to the native press. The result has been a large accession of subscribers. The Magazine has now a circulation of 3,250 and there is promise of a further increase.

The support given by all classes of Sinhalese has been very encouraging, subscriptions coming in from residents in the Straits and even Australia.

The educational influence of this publication, which is one of the most important factors in the Society's programme for reaching the cultivating classes, is incalculable.

Next year it is intended to enlarge and generally improve it.

I am greatly indebted to Mr. N. Wickramaratne for assistance rendered in the editing of this Journal.

The Society's Year Book.

Hitherto it has been customary for the Society to issue Calendars in the form of wall sheets embodying in a limited space information relating to the Society and also of a general agricultural character.

It was felt, however, that such calendars were inconvenient for reference. With a view, therefore, to supply a portable handbook, which would at the same time furnish a larger stock of useful information, the issue of a Year Book, albeit of modest design, was conceived.

The present publication, which has been somewhat hurriedly compiled, is put forward with all diffidence, and the compiler bespeaks the indulgence of the reader. With more time available in the future, it is hoped to bestow greater care on later editions, make good any omissions that are now found to occur, and add to the stock of information already provided.

The Year Book is priced at 50 cts., and can be had on application to the Secretary, or at Messrs. H. W. Cave & Co., the *Ceylon Observer* office, Messrs Plate & Co's. book-stalls, the Colombo Apothecaries Co's., and Messrs Whiteaway Laidlaw's. As only a limited number of copies have been printed early application should be made.

An Imperial College of Tropical Agriculture.

For some years past this subject has been on the tapis, but while the claims of other Colonies to own such an institution were advocated in certain quarters, the voice of Ceylon was silent on the point till the beginning of this year.

The matter was first mooted in the *Ceylon Observer* and subsequently came up for discussion before the Board of Agriculture on February 3rd. The Committee there appointed met at the Council Chamber on the 11th February, and again at the Chamber of Commerce on February 28th. The ultimate outcome of these meetings was a Memorandum in which a strong plea was made for Ceylon as the site for the proposed College. This memorandum has been published and widely circulated, and there are already indications that the claims of this Colony are coming to be recognised as pre-eminent.

The advantages of such an institution to the Colonist as well as the indigene will be considerable, while from an imperial point of view, Ceylon from its central position and with its great variety of tropical products, should serve the interests of students from all parts of the Empire in a way that no other country could.

Dr. Harold Mann, Principal of the Poona Agricultural College, admits that the existing agricultural institutions in India do not offer facilities for a training in tropical agriculture, and thus furnishes a strong argument from the Indian stand-point in favour of Peradeniya as the site for the proposed College.

Co-Operative Credit Societies.

His Excellency the Governor has been pleased to appoint the Director of Agriculture to be Registrar under the Co-operative Credit Ordinance, and Mr. N. Wickremaratne (one of the Society's Instructors) as Secretary to the Board of Control. These appointments are most opportune and appropriate and calculated to advance the cause of co-operation in agriculture which the Ordinance aims at fostering.

The Dumbara Society which did pioneer work in this connection has already been registered. Societies have also been registered for the Galle, Wellaboda and Hinidum Pattus, and Weligam and Galboda and Kinigoda Korales, while others are in the way of being established in the Gangaboda Pattu (Galle), Badulla, Hambantota and Puttalam districts.

At Puttalam a meeting presided over by the Assistant Government Agent was held on the 18th April, when Messrs. Wickremaratne and Karunanayake were present, and it was decided to forward an application for registration of a Society for Puttalam and Demalahat Pattus.

The Director has taken advantage of conferences held at Ratnapura, Galle and Kegalle to explain the principles of co-operative credit and point out the success which has attended the movement on the neighbouring continent.

The office of the Registrar and Secretary is at Peradeniya from where copies of the Ordinance, a leaflet on the subject by the Secretary of the Ceylon Agricultural Society, forms of application, and all information relating to the formation and conduct of Co-operative Credit Societies could be obtained.

EXPERIMENTAL GARDENS.

The Gardens inspected during the period under review are those established at Bandaragama (Panadura Dist.), Balangoda, and Jaffna.

The Bandaragama Garden is almost entirely an orchard, and chiefly devoted to the cultivation of citrus fruits. Its situation is excellent, and though the soil is not of the best, the conditions are generally good. The young plants are making fair progress and it has been decided to further extend the plantation during the approaching wet weather, and for this purpose a special consignment of grafted plants has been ordered.

The Balangoda Garden has been a year in working and has so far been specially devoted to the cultivation of vegetables. A large variety, including most exotic kinds, have been grown with considerable success, and seeds distributed in the neighbourhood. A part of the land is being planted with fruit plants and fodder grasses.

The Jaffna Garden which was started late last year has made a very good start. The principal crops cultivated are cotton, maize, cassava, manihot rubber, sugar-cane and fodder.

Mr. Madanayake reporting on the Hettipola rotation garden says that the plot of Hickory King maize gave a yield of 1,100 cobs.

A proposal to establish an experimental garden for Uva is under consideration.

The Assistant Government Agent, Puttalam, has arranged to start a garden at Anamaduwa, where cultivation is in a very backward state. This garden will be under the care of Mr. Karunanayake, Agricultural Instructor.

Preparations are being made for laying down experimental plots at Tissa under grass (Guinea grass, Mauritius grass and Kangayam grass) and other fodder crops, seeds of which have been recently introduced. These plots will be under the care of Mr. Jayasuriya, Agricultural Instructor, Southern Province, who expects to plant them up in the course of this month. The question of pasture is an important one in the Hambantota district, and steps are likely to be taken to meet the difficulty which periodically occurs of finding food for cattle.

SHOWS.

As a result of last year's big exhibition there is no likelihood of any Show on a pretentious scale being held this year, but smaller village Shows have not been affected thereby. The only Show held in the 1st quarter of the year was the one at Chilaw referred to in the previous Progress Report.

For April-May a quartette of four Shows, which are annual fixtures in the Kalutara District, was arranged in the following order :—

26th	April	at	Bandaragama
3rd	May	,,	Kelawellawa
10th	,,	,,	Kalutara
17th	,,	,,	Bandaragama.

Another likely fixture for a later date is a village Show in Udukinda division, Uva Province.

A statement of the accounts of the All-Ceylon Exhibition Committee shows a balance of some Rs. 21,500 to credit. At a meeting held at the Council Chamber on Monday the 21st April, the Committee considered how the balance in hand should be disposed of and when the next Exhibition should be held. The recommendations on these points will be submitted to-day by Mr. A. N. Galbraith, Officiating Secretary to the Exhibition Committee.

Paddy (Rice) Cultivation.

The Society has from time to time introduced new varieties of paddy likely to suit local conditions, and possessing qualities that commended them to the cultivators. The most recent of these introductions is *Molagu Samba*, which produces a fine table rice, procured through the Madras Department of Agriculture. The difficulty in introducing such new varieties is to find people willing to take the risks of cultivating them on a fairly large scale and (what is of greater importance) in carrying out experiments in a systematic manner and keeping careful records. In the present instance the Society has been fortunate in finding an enterprising field-owner in Mr. R. Chilvadurai Proctor, to whom the Agricultural Society is indebted for the following details:—" 2¼ bushels of seed were supplied to me by the Secretary of the Ceylon Agricultural Society. This was sown in an area of 8 paras sowing extent (usually receiving 6 bushels local seed).

"The field is situated at Kottege in Rajakadaluwa (Chilaw district). Sowing began on September 11th last and was completed in 4 days. The field, which was one of the poorest of the tract, returning, under fairly good conditions, an average yield of 9-fold was selected owing to its proximity to a tank for facility of irrigation. The land was first ploughed in village fashion and then worked over with the mamoty to turn down the grass. The manure applied consisted of a cart-load of green stuff, 6 bags old lime, and a cartload of sheep droppings.

"When two months of age the seedlings were found to be close set and of uniform growth, as the result of successful germination and tillering. This tillering habit was a striking feature. The crop was harvested on February 11th and the thrashing finished on the 14th idem. It would thus be seen that the age of Molagu Samba is just 5 months. The total yield of grain was 112 paras or 84 bushels, which represents rather over 37-fold. In December there was a high flood in the district as the result of excessive rain, and while the local (Elankalie) paddy crops in the adjoining fields were damaged by submersion or swept down by the rush of water, the Molagu Samba crop stood its ground well.

"The following are the financial details:—

Cost of 2¼ bushels Molagu Samba (seed) ...	10·50
Cost of ploughing 8 paras extent	9·00
Cost of cutting green manure	2·00
Cost of a Cart-load sheep manure	2·00
5 bags of lime (say)	4·00
Hire of buffaloes for ploughing (the animals were mine, but I charged the local rate)	8·00

Cost of turning over the sods, repairing ridges and sowing	10·00
Cost of transport of manure	2·50
Wage for watching the crop against cattle and wild animals paid in 2¼ parrahs 'Elankalie' paddy @1·25 per parrah	3 12
Reaping & thrashing—8 men worked 3 days at 50 cts. per diem	12·00
Food and drink to above	10.00
Food and wages to 1 woman who cooked and assisted in winnowing paddy	3·00
Hire of buffaloes treading the corn...	1·50
Cooly hire for conveying stacks of straw to the thrashing floor	3·00
Cooly hire for driving the buffaloes and winnowing paddy	2·00
Total	82·62

"As against this Rs. 82·62 the return was 84 bushels of paddy of the finest quality, say at Rs. 2/- per bushel, though I consider it worth more, as the rice is a fine table variety Rs. 168·00

250 bundles straw @ Rs. 8/- per 100 bundles, local rate at the thrashing floor	20·00
	188·00
Deducting expenses	82·62
Balance Rs.	105·38

"The net profit thus represents a return of 128% on the capital outlay in 5½ months. Assuming the field to be cultivated (as is usual in the locality) twice in the year, the net annual profit, even after deducting a reasonable sum for rent, management (the Vel-vidana generally gets 2% of the produce), the interest on capital would be considerable." (Samples of rice and of paddy are submitted for inspection.)

The cultivation of the *Matale field* (referred to in last Progress Report) under the supervision of Mr. Molegode has been completed. The arrangements for taking it over were made late and the field had therefore to be prepared in the usual way. The yield was 86 bushels grain and 1,534 bundles straw. With the early S. W. Monsoon rains the field will be got ready for a leguminous crop, part to be sowed with cowpea (*Vigna catiang*), and part with green gram (*Phaseolus max*) and the Maha crop will be of the same variety of paddy as previously cultivated. This should indicate the value of rotating paddy with a leguminous crop where possible.

A small plot of *Molagu Samba* cultivated by Mr. Madanayake, Agricultural Instructor, at Wariyapola, gave a return of 44 fold, while Mr. Beddewela of Maligatenne, Kandy, reports that heavy rains at the blossoming period spoilt his crop which only yielded 16 fold.

Mr. Bandaranayake, the Agricultural Instructor in Badulla, has completed a series of experiments with a view to determine the value of green manuring and transplanting. These were carried out last Maha season in a field in Udukinda with 5 months paddy. Green manures in the form of Dadap (*Erythrina lithosperma*) leaves and twigs were applied with the first ploughing. At the time of the second ploughing (i.e., within 6 days) these were found to be completely decomposed. 5½ weeks old seedlings were transplanted, an average of 3 plants being placed in each hole at an average distance of 7 inches apart. An acre of paddy has given a yield of nearly 48 bushels which is considered very satisfactory in a place like Udukinda especially during the last season which was not a good one. The output of straw was extraordinarily large and is attributable chiefly to the leguminous green manure.

COTTON.

Samples of Allen's long staple cotton grown in different parts of the Island are on view to-day, so that members will have an opportunity of judging of the produce of different districts. Details of the trials are also furnished. It will be seen that the prospects in the Hambantota district are decidedly promising. The plantation at Ambalantota, which was inspected by the Director of Agriculture and the Secretary of the Ceylon Agricultural Society on 6th March, was carefully supervised by Mr. Jayasuriya, Agricultural Instructor, S. P. Up to time of writing 1,558 lbs. of first grade seed cotton have been gathered off a plot of $1\frac{1}{3}$ acres. Messrs. Freudenberg & Co., Agents for the British Cotton Growing Association, say of the lint: "Very clean, silky appearance, fine long staple ($1\frac{1}{4}$ to $1\frac{1}{2}$ in.)". Mr. Jayasuriya expects that not less than 200 acres will be laid under cotton in the Hambantota district next season.

Mr. Doole Mudaliyar's trial at Ambalantota has also done well.

Mr. Madanayake, Agricultural Instructor, N. W. P., reports that the cotton at Hettipola suffered much as the result of unseasonable rains during the time of blossoming; that the yield at Balalla was far from satisfactory, but much better at Diulegoda (near Nickaweratiya) where the plots attracted the attention of villagers who are applying for seed.

COCONUT CULTIVATION.

A correspondent wrote enquiring whether there was any reliable means of telling the age of a coconut palm from its external appearance, and the question was referred to experienced planters for their opinion. In his letter, the correspondent stated that he was successful on various occasions in guessing at the ages of young trees, but not so in the case of old trees.

Mr. A. W. Beven writes: "If your correspondent states what is in accordance with fact, he answers the question raised by himself. For my part I will not undertake to definitely state the age of palms, the previous history of which I was ignorant of. I know of trees over 30 years old with stems 12 feet high, and others 13 years old with stems 15 feet high. I am aware that those who profess to guess the age of the coconut-palm are not guided by the height of the stem but by the scars left by the fronds. These scars may be set much closer in the case of the older and shorter palms than in the others. While not asserting that it is impossible to guess the age of a palm, I do not think it is possible."

Mr. A. E. Rajapakse states that it is quite impossible to tell the age of a coconut palm by looking at it, *i. e.*, from its outward appearance, as growth varies so much according to soil and other conditions, as well as the care bestowed upon it. He knows of palms planted among cinnamon about 10 years ago that do not look more than a year old. He also knows of plants put down on bare land and liberally manured, which flowered in 3 years and 8 months.

Mr. J. D. Vanderstraaten writes: "I do not know of any method of telling the age of a coconut palm by looking at it. The frond scars are not sufficient guide since the number of fronds put out by a palm depends entirely on the amount of care or neglect to which it is subjected, as well as the conditions under which it is found growing. The number of fronds borne by a palm may be as low as one and as high as twenty (I have known it to be twenty-four) in a year. I have seen young plants lying dormant for years and making no growth whatever—owing either to deep planting, hard soil, or other causes."

In this connection it may be mentioned that in "*The Cult of the Coconut*" the author claims to be able to determine the age of palms by dividing the number of rings or scars left by fronds by two, since according to him two such rings are created annually.

The question of establishing coconut trial grounds in the Chilaw, Veyangoda and Galle districts is being followed up. Several owners have come forward with offers of land, and the final selection of areas will be made shortly.

SUGAR-CANE.

Efforts have been made to improve the yield of sugar in canes by means of manure and the introduction of better strains from abroad.

The Government Agricultural Chemist who was consulted about Mr. M. A. Jayasingha's sugar plantation in Nagoda made analyses both of the soil and the cane juice and recommended the following treatment for increasing the sugar content: "Keep the soil in as fine a tilth and mulch with as much organic matter as possible. Clean-weed the land till the shade from the cane kills the weeds. Apply burnt lime at the rate of 3 cwt. per acre. A suitable manure would be 500 lbs. groundnut cake, 100 lbs. each of ordinary superphosphate, Kainit and sulphate of potash." (Four hundred pounds of this manure were kindly supplied free of charge by Messrs. Freudenberg & Co., for a comparative trial.)

The result of the manuring, so far as can be judged by the growth, is most satisfactory, but an examination of the figures showing yield of cane and the sugar content of the juice will be necessary for a correct determination.

Arrangements are being made for the cultivation of the new varieties of cane (known as B 208) introduced by the Society.

Under *Introductions* reference is made to four new canes from Demerara. These cuttings are from the best seedling canes.

FRUIT CULTURE.

A consignment of date palm suckers was received from Egypt through the courtesy of the Director-General of Agriculture for a further trial, as the last lot imported in 1906 did not get a fair chance. Ten suckers of each of the following varieties arrived in good condition: Siwi, Birkawa or Hayani, Amhat and Sultani. These have been planted at Jaffna, Point Pedro, Mannar, Puttalam, Calpentyn, Kurunegala, Batticaloa, Hambantota and Tissa.

Of the two Bayano plants (*Mangifera verticillata*), referred to in the last Progress Report, one has been planted in the Government Stock Garden. A further lot of seeds of this new fruit is shortly expected from the Philippines.

A large order for fruit plants (chiefly grafted) has gone out to Bangalore, and will arrive before the end of May. They were expected about the first week but the drought in India upset the calculations of the nursery-man. In any case the plants which are all booked to order will be in good time for putting out during the June rains.

Referring to grafted grape plants supplied by the Society, the Assistant Government Agent, Puttalam, reports that a plant grown under the supervision of Mr. Rosairo, Registrar of Calpentyn, bore fruits of a light purple colour, much superior in flavour to the grapes commonly cultivated. The variety sent was the Black Hambro'. A further lot of grafted plants of the best varieties will be sent to Jaffna and Calpentyn in May.

The Asst. Govt. Agent, Puttalam, has had a sum of Rs. 300 placed at his disposal by the Committee who were responsible for the successful show lately held in Chilaw, and has decided to devote this sum to purchasing suitable plants and seeds for distribution among villagers.

A number of grafts from the excellent collection of mangoes on the late Dr. William Dias' Yakella estate near Heneratgoda will be shortly ready for removal to the Stock Garden.

Through Mr. D. S. Blazè of Ipoh, F. M. S., the Secretary obtained a few plants of the seedless pumelo, also some fruits of the same which were sweet and of good flavour.

Pullesang (*Nephelium mutabile*) and Indian Bhere (*Zizyphus jujuba*) seedlings are available to members at 50 cts. per plant obtainable from the Seedsman, C. A. S., Govt. Stock Garden, Colombo, also layered plants (of which there are only four) of the seedless pumelo at Rs. 5 each.

INTRODUCTIONS.

A small lot of cuttings of the best varieties of sugar-cane was received from the Director of Agriculture, Demarara. They consisted of D. 118, 419, 721, and 167. The cuttings came packed in charcoal dust, and though somewhat dry had not quite lost their vitality. They have been set down in the Government Stock Garden. The first crop of B 208 cane raised at the Stock Garden was taken in last month, and the bulk of the cuttings were sent to Mr. M. A. Jayasinghe, the Nagoda sugar planter.

The first crop of yam sets received from the Director of the Gold Coast was taken up in April. The varieties received were :—1. Osuba (white), 2 Mayaku (white), 3 Kani (yellow) and Kani-ukuka (yellow). Eight sets of No. 1 returned 35 lbs.; six of No 2, 9 lb.; five of No. 3, 24 lbs.; 2 of No. 4, 9 lb. The varieties, which are new to the Island, are a welcome addition to our local *dioscoreas*. Sets have been distributed to School and Experimental Gardens.

In response to a request from certain members for seeds of fodder plants for trial, a small supply of the following varieties was imported: Peruvian Lucerne, Turkestan Lucerne, Tree Lucerne (*Medicago arborea*), Teosinte or Reana grass, different kinds of sorghum (Jerusalem corn, Dhoura or Egyptian corn, Kaffir branching corn, Undendibule sugar cane, Millo maize, Amber sugar cane, Johnson grass or Evergreen millet, and Seradella (*Ornithopus sativus*). These are also being tried in the Society's gardens in different parts of the Island.

A crop of over 1,000 cobs of Hickory King Maize was got from the plot in the Hettipola Garden. Mr. Madanayake, Agricultural Instructor, N.W.P. has distributed the bulk of the seed to villagers for planting during the S. W. Monsoon rains. A quantity has also been sent for storage at the Government Stock Garden and is available to members.

Mr. Jayasuriya, Agricultural Instructor, S. P., has arranged to plant up a maize field in May, and 10 lbs. seed obtained from the Experiment Station, Peradeniya, has been sent to him.

A small parcel of *Acacia dabshiaca* seed has been received from Egypt, and is being given a trial. It is recommended as a wind-break for hot countries provided irrigation is provided, and under favourable conditions is said to make a thick-set hedge in six months. It lives for at least six years. It can be pruned to any height. The seedlings have come up well.

About 50 lbs. of black Java Soy-bean seed are available to members at 50 cts. per lb obtainable at the Government Stock Garden, Colombo.

The chief of the Division of Horticulture, Manilla, has sent a parcel of *Zizyphus trinervis* which he describes as a tall shrub or thorny tree. It ought to prove useful as a fence plant.

The cultivation of Broom Corn on a large scale is likely to be undertaken by a landowner in the Southern Province with the assistance of an expert. The commercial utility of this crop is referred to on page 475 of the *Tropical Agriculturist* for December last.

SERICULTURE.

The *Imperial Institute Gazette* for the last quarter of 1912, refers to two samples of silk produced at the Society's Silk Farm at Peradeniya, under the management of the Salvation Army, and sent by the Secretary, to the Director of the Imperial Institute for report :—

No. 1. "Product of the Mysore silkworm." This consisted of a skein of silk of pale fawn colour with a greyish tinge. The silk was clean, but of unsatisfactory colour.

No. 2.—"Product of a hybrid between Mysore and Bengal silk-worm." This sample consisted of a skein of golden-yellow silk, with a high lustre resembling that of Italian silk, but was rather dirty and specky.

The silks were examined with the following results:

	No. 1.	No. 2.
Moisture, per cent.	9·3	9·9
Loss in weight on degumming with a 1 per cent. soap solution, per cent.	26·1	21·9
Colour and lustre after degumming	Pure white and highly lustrous	Cream-coloured and highly lustrous
Titre (size or fineness)	17 to 19 deniers. Average: 18 deniers (international).	Irregular ; 15 to 20 deniers Average : 17·5 deniers (international).

The samples were submitted to a firm of spinners, who described them as marketable silks, and valued No.1 at about 12s. per lb. and No.2 at probably 12s. to 13s. per lb., with East Indian Surdah silk at 11s. 3d. to 11s. 9d. per lb. The spinners expressed their willingness to carry out practical trials with large samples of these silks, in order that their value might be accurately ascertained.

A very instructive wall card, suitable for use in schools, is obtainable at 50 cts. each from the Manager of the Silk Farm. Besides descriptive notes and illustrations of the chief silk worms (the mulberry, eri, and muga), samples of cocoons and silk are shown on each card.

APICULTURE.

Continued efforts in the working of the mill for making comb-foundation for the local honey bee (*Apis indica*) have been rewarded with a fair degree of success. The wax used was obtained from Kurunegala and Ratnapura districts at something under Re. 1/- per lb. The bees at the Stock Garden are working well on the foundation, some of which has gone out to India. The price at present charged is Rs. 2·00 per lb. The working of the mill is rather a complicated matter requiring careful regulation of temperature and other conditions. Local wax is dirty and troublesome to purify.

The question of standardising the hive for *Apis indica* bees has been discussed in all its bearings by members of the Bee Committee, and the matter is now being submitted for final consideration with a view to a coincidence of views, which have so far been somewhat divergent. If the same standard could be adopted for India and Ceylon, a great point will have been gained.

LAC CULTURE.

The brood lac for Kon (*Schlichera trijuga*) has not turned out much of a success owing (1) to the insects having emerged *en route* and (2) to the damage done by pests. A sample of the resulting stick lac was submitted to the Imperial Entomologist of India who reports that he found it to be

mainly damaged by predaceous caterpillars, and discovered a living larva of *Enblemma coccidifraga* in the tunnels formed among the lac. Only a few cells were unaffected and filaments found on them. A further cause of damage is said to be a minute *Hymenoplerous* parasite (*Chalcidæ*). The same insects are known to cause damage at Pusa, especially to the June-October crop, the October-June crop being comparatively immune. It is thought that the same conditions will be found to prevail in Ceylon. As the cultivation of lac spreads, however, it is expected that the damage by these enemies will grow less. The Imperial Entomologist suggests that the inoculated trees be occasionally examined and the caterpillars destroyed in their tunnels and in the pustule-like cocoons found among the lac.

Writing on the 5th April, the Imperial Entomologist says :—" As soon as I am able to arrange for *Pithêcolobium dulcis* or *P. saman* brood lac. I shall let you know beforehand to enable you to make suitable arrangements for receiving the parcel." The two trees mentioned are respectively the Madras thorn and the Rain tree, both common enough in the Island, and used as hedge and shade plants.

The first inoculation of Bhere (*Zizyphus jujuba*) lac is expected to yield a small crop in May-June.

ENSILAGE.

The Director of Agriculture, Jamaica, made the following reference to Ensilage in his annual report for 1912 :—

" Forty tons of silage was prepared from guinea corn (cut in the ear) and guinea grass by the use of a Massey-Harris 'Blizzard' ensilage cutter worked by a 20 h. p. gasoline engine.

The product was excellent and it was fed to the cows for three months to great advantage during a period of very dry weather. The cutter requires some alteration to suit it for guinea grass fodder but we hope to get this effected through the kind interest of the experimental department of the Massey-Harris Co. in Canada.

Our results indicate that the silo should enable large stores of excellent fodder to be stored during our periods of uncontrolled abundance for the dry months when green fodder is scarce and poor. All the imported and native milch cows have taken readily both to silage and chopped sugar-cane and these two materials should enable us to maintain at least twice as many head of stock on a given acreage as could be supported by ordinary grazing alone."

On application being made for further details, the Director replied that these will be embodied in his next annual report which will be forwarded in due course.

He adds :—" We made 60 tons each of Guinea grass and Guinea corn silage last December. The product is excellent and our cattle eat it with great relish. I can confidently recommend silage for the feeding of cattle where dry periods have to be faced. Our plant cuts 5 tons per hour and has been found easy to operate with ordinary supervision. We have a 20 H.P. Gasoline Engine and a Massey-Harris (Canada) " Blizzard " cutter and blower. Our two silos are made of American white cedar and the materials were imported ready for erection. Next year I hope to erect a reinforced concrete silo to extend our storage capacity."

These details are particularly interesting and suggest the possible solution of the difficulty regarding stock feed during seasons when fodder is scarce, particularly in the dry zone.

INVESTIGATIONS.

The following further report dated 4th February, 1913, on Margosa seed (*Azadiachta indica*) was received from the Director of the Imperial Institute :—" I have to inform you that the fat yielded by the seed has now been further examined, in order to ascertain whether its unpleasant odour can be easily removed. It has been found that the odour is due to the presence of a compound of sulphur, which apparently cannot be removed by means of solvents or by any simple and inexpensive process. The odour disappears on distilling the fat with steam, but subsequently develops again, possibly owing to the formation of a further quantity of the sulphur compound by the hydrolysis of a glucoside. The nature of this compound is a matter of some scientific interest, and it is proposed to examine it further at the Imperial Institute as opportunity offers. In view of the above results, and the small quantity of Margosa seed apparently available for export from Ceylon, there does not seem to be any prospect of creating a trade in the product at the present time.

With a view to investigating the properties of *Gloriosa superba* (Sin. Niyagala) a firm of English Chemists indented for a quantity of the tuberous roots, in the collection of which the officers of the Society rendered assistance.

Similar assistance was rendered in ascertaining the area under *Hedychium coronarium*, the new source of raw material for paper making.

Reporting on a sample of *coca leaves* from Ceylon an American authority states that they yield .572 to .600 per cent. alkaloid which is only about a third of what is found in Java leaves.

MISCELLANEOUS.

Reports have been received regarding the depredations of the Kalutara snails (*Achaticia fulica*) in the Yatagala school garden near Kosgoda.

A correspondent writing from Kosgoda states that they are multiplying fast in that locality. He says:—" I got 3 boys to collect 15 basketfuls in about 3 hours from a 7 acre garden in which the snails are daily hunted down. In one evening 3 boys collected 3 basketfuls in 20 minutes." The same correspondent reports that the snails do damage to radish, bandakka and cucumber, and that he had to give up vegetable gardening owing to the trouble they caused. Specimens of the snails and the vegetables attacked by them have been called for and will be submitted to the Government Entomologist.

A small *breeding farm at Tissa* is on the cards. The cost of upkeep is to be met by local effort, and the young Kongayam bull imported last year from Coimbatore (at present in Jaffna) will be transferred to Tissa when the necessary arrangements have been completed.

Preparations nave also been made for carrying out a series of trials with *fodder crops at Tissa* under the supervision of Mr. Jayasuriya, Agricultural Instructor.

An application was received from Burma for the services of an officer with experience of *coconut cultivation*, and Mr. Percy Herft, late of the Peradeniya Experiment Station, accepted the appointment and left for Akyab early in April.

In reply to an enquiry from a correspondent as to whether barbed wire fixed spirally round the stem of coconut palms at intervals of 6 feet would damage the tree, the Government Mycologist states that he does not think it likely to do harm provided the staples used for fastening the wire are not over $\frac{3}{8}$ inch long. This device is claimed by the correspondent referred to as an effectual preventive against theft of nuts off standing trees.

A question having been raised as to whether *white ants* are found in soils containing a fair proportion of lime, enquiry was made to ascertain if white ants do much damage in the Jaffna peninsula. Mr. V. M. Muttukumaru reports that in the Puneryn, Karachi, and the Island divisions they are known to attack paddy plants, while in other divisions they attack the roots of cassava, tobacco, &c.

A new scheme of work was organised in connection with the *School Garden at Nugawela* on lines laid down by the Director of Agriculture, with a view to allowing the school boys to compete for awards. The practical working out of the scheme was entrusted to Mr. Molegode, Agricultural Instructor and before the school broke up for the Easter holidays the prizes were distributed by Dunuwile Dissava at the request of the Director who was also present.

A *Junior Agricultural Book* for use in Ceylon schools has been prepared by the Secretary at the request of Government and forwarded to the Director of Public Instruction together with the necessary blocks for a coloured frontispiece and 45 text illustrations.

A correspondent from Galle district reported that in a *plantation of coconuts* put five years previously, into a hard gravelly soil, only some half a dozen formed trunks, and that though manured they were not making headway. The Government Agricultural Chemist advised broadcasting 2 cwt. of burnt lime per acre in 12-15 feet circles from base; forking, mulching, and draining, and manuring with a prescribed mixture of fish, bone and kainit. If it was found on making a cutting that there was a hard pan below, dynamiting was suggested.

PERSONAL.

The Society takes this opportunity of welcoming to the Island His Excellency The Hon'ble Mr. Reginald Stubbs whose high office will present him with many opportunities for furthering the objects of this Society and the cause of agriculture in the Colony. While congratulating itself on what it has been able to achieve during the past two administrations, the Society looks forward with renewed hope to greater achievements under a new Governor and a new Colonial Secretary.

Sir Rider Haggard, the celebrated novelist, a keen student of agricultural questions and an ardent advocate of co-operation in agriculture, was a visitor to the Island at the end of February, and the staff of the Agricultural Department had the privilege of meeting him through the courtesy of the Director.

The Society extends a welcome to Mr. Dudley S. Corlett who joined the Agricultural Department in February as Superintendent of the Peradeniya Experiment Station and to Mr. A. Rutherford who assumed duties as Government Entomologist in April. The Society shares in the general regret at the retirement of Mr. E. E. Green. Mr. Green held the office of Government Entomologist for 14 years and his profound knowledge of his subject secured for him a reputation far beyond the confines of this Island. Mr. Green will best be remembered in connection with his study of the *Coccidæ* of Ceylon and the scale-bug *Lecanium viride*, and as the founder of the quarantine station in Colombo for the treatment of all imported plants. For the willing services he rendered as adviser on matters relating to agricultural pests the Society is under deep obligations to him.

With the departure on leave of the Hon. Mr. Bernard Senior the Society temporarily loses a Vice-President, whose advice on financial questions is greatly valued.

The Society welcomes the good news regarding the improved health of its president, Sir Henry McCallum.

C. DRIEBERG,

Secretary, Ceylon Agricultural Society.

Peradeniya, 9th May, 1913.

SOME PROBLEMS CONNECTED WITH VILLAGE CULTIVATION IN CEYLON.

By W. A. de SILVA.

Much has been said and written about the improvement of village agriculture in Ceylon. There are still some problems that call for careful investigation before any permanent improvement in the condition of the village cultivator can be effected.

In the more popular districts of the Island two things are noticeable—one the insufficiency of land for the maintenance of all those who are engaged in cultivation, and the other the gradual depreciation in the productive capacity of the land which is under cultivation.

There is again the vast extent of untilled land in the South-Eastern and North-Central districts of the Island, where the population is very scanty and where, with the abundance of land, the people are hardly able to eke out an existence.

The above state of things is due to a series of causes which are fairly complex, but it may be interesting to make an attempt to find out some of the main factors that underlie these causes. They can be summarised as follows :-

1. The absence of inducement for people in populous districts to emigrate into the unoccupied areas.

2. The enervated condition of the sparse population inhabiting these large areas.

3. The absence of means of obtaining ready and cheap supplies of fertilizers for use in village cultivation.

In spite of the fact that nearly ten millions of rupees have been expended in the attempt at providing facilities for irrigation purposes in the unoccupied areas of the Island, no large area of hitherto unoccupied country can be profitably opened up until capital and enterprise are attracted to them. But capital will not be attracted where labour is scarce. No immigration of labour is possible till the condition of the people already living in these areas is considerably improved. Much has been done towards improving the health of the villagers living in these wild tracts.

Irrigation rules, Forest regulations and Land Settlement are all good in their own way ; but when they are applied in their strict sense among an ill-fed and enervated people, who work without any capital and whose earning capacity is as limited as their means of existence, no rapid improvement in their condition can be expected. For instance, a fine of one hundred rupees imposed on a villager whose earning capacity is perhaps less than 10 cts. a day is sufficient to cripple a whole village for several generations. If a person earning a salary of Rs. 300/- a month is to be fined according to the above scale, it will mean a fine of Rs. 10,000/-. But where during a year the aggregate fines for breaches of regulations in a given area amounts to several thousands of rupees, it is hopeless to effect any advancement in the condition of the people unless some means can be found for increasing their earning capacity to meet these extraordinary demands.

The above illustration clearly points out the impossibility of improving the condition of the villagers or of encouraging the development of these large uncultivated tracts by the enforcement of rules and regulations which may be suitable under other circumstances.

Much has been said against what is known as *Chena* cultivation. There is a tendency to discourage it by all possible means. It is, however, often forgotten that the system of *Chena* cultivation is the only one suited to the climate and condition of the soil in the areas where it is practised as well as to the means of the people inhabiting these areas. *Chena* cultivation, when carefully studied, does not appear to be so unscientific or so destructive, as it is usually supposed to be. This method of cultivation is one eminently adapted to areas, where the rainfall is small, where cattle are scarce, where fertilizers are not procurable, where the population is scanty, and where the climatic conditions of health do not permit of large supplies of labour. The best of systems can be abused; and so perhaps *chena* cultivation has been.

Methods similar to *chena* cultivation are to-day practised under conditions of advanced agriculture by capitalists in the growth of very profitable crops under most expert scientific management. The sugar fields of Java and the Tobacco fields of Sumatra are cultivated more or less mainly on the same lines as *chena* cultivation among the Sinhalese villagers. Land on which the best sugar-cane and tobacco are grown is cultivated about once in ten years, and except on these conditions it has been found that their cultivation is not profitable. The Companies engaged in the cultivation of sugar-cane and tobacco in these countries employ expert managers and a large staff of well-trained agricultural chemists. They divide their plantations into ten or more divisions and each year cultivate one division. Under this system it has been found that instead of an apparent waste consequent on 9/10 of the land being left fallow, there is an actual considerable gain. The villagers no doubt are unaware of the scientific problems connected with their time-honoured method of cultivation; but they are the descendants of a once highly trained and prosperous people, and these methods have come to them from their ancestors. What is urgently required is not the discouragement of *chena* cultivation but its encouragement and its improvement. There are many ways in which the system can be improved and these, it is trusted, will secure the attention of the new Department of Agriculture. In the meantime *chena* cultivation should receive every encouragement, both as a means of improving the condition of the resident population and as a means of attracting new comers to these unoccupied districts. Where land is abundant, and where it has lain for centuries without contributing anything towards the sustenance of man, it is imperative that it should be made to do so by whatever means possible.

Tracts of land with valuable timber can be preserved and the rest leased out on very easy terms to those who agree to settle in the new country. They can be given ten times the land each family can cultivate within a year, and there is no reason why they should not *chena* 9/10 of the holdings each year as is done at the present day by the scientific experts conducting the cultivation of tobacco and sugar-cane. The first requisite of a cultivator without capital is the production of such food crops as are required for his immediate wants, and there is no reason why the villager should be discouraged from producing his first requisites. There is also under this system the possibility of organising an industry in cotton as well as oil seeds. There will be sufficient capital forthcoming to encourage these industries. The necessity for encouraging the production of oil seeds in Ceylon is felt every day and the large planting industries—Tea, rubber and coconuts—will be greatly handicapped, unless within a reasonable period Ceylon is able to produce large quantities of oil seeds such as castor, sesamum, groundnuts. Oil cake is a very important factor in the manuring of plantations, and the quantities of these now imported amount to nearly 350,000 cwts. per year. With a ready supply plantations in Ceylon can profitably use ten times this quantity. The cost of oil seed cake has increased within the last ten years by about 100% in value. There is also the question of supply of feeding cake for cattle. Ceylon has, roughly speaking, $1\frac{1}{2}$ million head of cattle. This number is

very much below what it should be for the maintenance of cultivation and transport work. Even three or four times this number will hardly suffice for efficiency. The scarcity of fodder and cattle food is greatly felt even for maintaining the present very limited and inadequate number of cattle.

The question of an efficient supply of fertilizers is of great importance not only in connection with the large planting industries but also in connection with the village cultivator. The encouragement of the cultivation of oil seed is one of the means of supplying this want.

The production of fodder crops and the increase in the number of catt e kept for agricultural purposes is another means towards this end and the success of both these depends on the opening of the large tracts of unculti vated land in the Island by encouraging and directing the only efficient method of putting these lands into use, viz: *Chena* Cultivation.

In this connection I might refer to the possibility of using refuse salt for manurial purposes. Common salt is highly valued by many cultivators as a manurial ingredient, but owing to the tax on salt it is not available to them though it can be produced for about 45 cts. a cwt. The selling price is fixed at Rs. 3/- per cwt.

I have to thank the Hon'ble the Controller of Revenue for kindly supplying me with the following information in regard to the salt supply of Ceylon :-- "The quantity of salt collected is more or less sufficient for the consumption which at present amounts to about 530,000 cwt. per annum. At the end of the past year Government had in hand 1,066,089 cwts. of salt, somewhat less than 2½ years' demand, which is held on reserve against barren years. It may be possible to increase the manufacturing area at Puttalam, Trincomalee and at Jaffna; but I have no definite information on the point. More salt might be collected from the Hambantota Lewayas, where it forms naturally if a large labour force can be got together there. The formation at Bunda is seldom or never collected in full before rain dissolves it."

At Rs. 3/- per cwt. salt cannot be used profitably in agriculture, but at Re. 1/- per cwt. there should be a steady demand for it. Therefore the question of cheap salt for agricultural purposes is worth consideration. It is not generally known that a large quantity of common salt mixed with Potash salts is now imported to Ceylon and used as a manure under the name Kainit.

It should be possible to issue Ceylon salt for purpose of manure mixed with about 10% of Chloride of Potash so as to render it unfit for culinary use. This mixture can be sold at Re. 1/- at a profit of about 25 cts. per cwt.

W. A. de SILVA.

Colombo, 1st May, 1913.

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A FEW ROUGH NOTES AT PERADENIYA.

Thanks to the kindly hospitality of Mr. Lyne (first Director of Agriculture to Ceylon) I have been enabled to take leisurely strolls in classic Peradeniya. In these latter times what a centre for distribution into, and for, British Equatorial territories might not be made to become, situated as it is right on the ocean-fairway of communication.

Up to the present its accumulated data of the past century, and its acclimatization already of many individual specimens of trees and staples, appear to be scarcely known to the public in general. No doubt these might be greatly extended, especially as regards better varieties.

It would seem to be that, as an establishment centre for distribution, Peradeniya stands unrivalled with its situation and climatic range. In the matter of spacing for the full development of the larger forest timber trees and the like, that can hardly obtain in *any* area of limited extent. Much, however, could be done to relieve congestion in the case of Peradeniya with its branch or affiliated gardens ; those in the lowlands especially being better adapted climatically for the more essentially equatorial things.

I may, by way of illustration, instance a few of the specimens noticed therein as already established.

Among timber trees : a well grown Honduras Mahogany may be seen outside the main gates.

The Kauri pine (the Tropical Australian species).

The Bunya-Bunya pines, also of Eastern Australia. The former attains to great height and timber yielding capacity ; its timber being of close grain is good for flooring and planking. The latter rather more valuable as a handsome cabinet-wood; its cones are remarkable, among pines, as containing nutritious nuts, which are much sought after by the natives. Both these trees are very local in distribution, in their own country—especially the Bunya—it being restricted formerly to one district only in Queensland.

I notice here another North Australian *Arancasia*—The "Moreton Bay pine."

Another Australian *(Castenospermum Australe)* is not only a large growing and very handsome tree in itself, but is productive of a valuable cabinet-wood. It is known as "Moreton Bay Chestnut." The timber, which is very durable, is easily worked with tools and takes a high polish, somewhat resembles dark walnut wood.

The reason for so many of the North-Eastern Australian trees having been called "Moreton Bay" (Fig, Ash, Chestnut, &c.) is that, although growing better further North, it was the first port opened up for settlement for the Northward.

The Brazil-nut tree (*Bertholetia excelsa*) is one of the largest timber trees of the tropics. In the highlands on the right bank of the Amazon-Topajos Rivers, I have seen it growing to enormous columns with most magnificent dome-like canopies; it is then the feeding ground for the rare and beautiful Hyacynth Macaw. The leaves, shaped like a larger Spanish chestnut, are very handsome. In its own land the forest Indians used to beat their blankets and sheating out of the inner bark with hard wood mallets. Even if it became extensively planted out in Eastern areas, I suppose it would hardly be used for timber since the "Brazil-nuts" and the bland oil therefrom are too valuable.

There is another Brazil-nut tree at Heneratgoda, but the only other specimen tree I know of in the East is that at Singapore.

Near the Director's bungalow may be seen a fine specimen of the Tropical American tree Entrolobium which furnishes a class of timber known by the trade-name of "rosewood" and growing up and over its bark, using the great tree as a "host," may be noted a particularly fine aroid (*philodendron*). Attention may also be called to another aroid in the Gardens (*Monsteria deliciosa*), from Southern Mexico. This aroid is notable since it yields a luscious fruit, not unlike a fine grape in flavour and appearance. It may be distinguished in that its large leaves are deeply serrated and indented.

Of course for me personally Peradeniya is specially interesting as containing a goodly number of the original stock trees from the valley of the Amazon—of 1875-6 *Hevea* Para Rubber.

H. A. WICKHAM.

PERADENIYA, March 1913.

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THE GERMAN EMPEROR AS AN AGRICULTURIST.

At the annual meeting of the German Agricultural Council the Emperor William delivered an address on the results of land reclamation experiments carried out on his estate at Cadinea. His Majesty gave statistics which showed that reclamation of the marshland on the estate had proved a financial success. He claimed, moreover, to have proved that argricultural production in Germany could be so increased as to satisfy the home demand not only for meat but also for bread.—*The Gardeners' Chornicle.*

VEGETABLE IVORY.

The trade in vegetable ivory, locally known as *tagua* (the nut of the *Phytelephas macrocarpa*, also known in commerce as *marfil vegetal* and corozo nut) is developing. There are large numbers of the palms from which this nut comes in the territory tributary to Iquitos. They are not cultivated, but grow wild in the forest. The nuts grow in clusters of rounded pods with spike-like projections, each pod containing 4 to 6 nuts, with 12 to 20 pods in a cluster. When ripe the pods open and the nuts drop. The ripe kernels are very hard and white. The trees are found in groves with a comparatively small amount of underbrush, simplifying the gathering. There is no particular season. It takes about two years for the nuts to ripen.

Vegetable ivory is used in the manufacture of buttons, umbrella handles, door knobs, toys and inlay work. The buttons made from tagua take a good lustre and are very durable. In the process of manufacture the nuts are cut in two on the long axis and squared by cutting off the ends. The principal markets are London, Havre, Hamburg, and New York. These points, however, are all distributing centres in the trade, the factories using the nuts being located in south Germany, Italy, London, and Birmingham.

Of the vegetable ivory exported in 1911, totalling 991,000 pounds, 45 per cent. went to Havre, 30 per cent. to Liverpool, 22 per cent. to Hamburg and 3 per cent. to New York.—*Peru To-day.*

THE COLOMBO FUMIGATORIUM.

The following table shows the number of Seeds and Plants passed through the Fumigatorium, January-March 1913:-

	Tea seed, cases.	Oranges & lemons, cases.	Bulbs & plants, packages.
January ...	330 ...	236 ...	38
February ...	205 ...	221 ...	13
March ...	152 ...	160 ...	36
Total ...	687 ...	617 ...	87

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A. M. & J. Ferguson are Agents for the sale of the following Circulars issued by Departments of Agriculture in the East, *viz :—*

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The Rubber Planting Industry of Ceylon and the Incision Method of Tapping, by R. H. Lock.
Cacao Cultivation in Ceylon, by R. H. Lock.
Report on Experiments in manuring old Cacao, at Peradeniya between 1903 and 1911, by R. H. Lock.
Notes on the Tapping of Hevea Brasiliensis by the Method of Paring, by R. H. Lock.
A Root Disease of Hevea, by T. Petch.
Effect of Different Intervals between Successive Tappings of Rubber, by M. Kelway Bamber and T. Petch.
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Cacao & Hevea Canker, by T. Petch
Root Diseases of Tea, by T. Petch.
A Visit to a Rubber Factory, by J. C. Willis.
Cymbopogon Grass Oils in Ceylon.

Bulletins of the F.M.S. Department of Agriculture, 8d each, post free.

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The Tropical Agriculturist.

[Journal of the Ceylon Agricultural Society.]

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